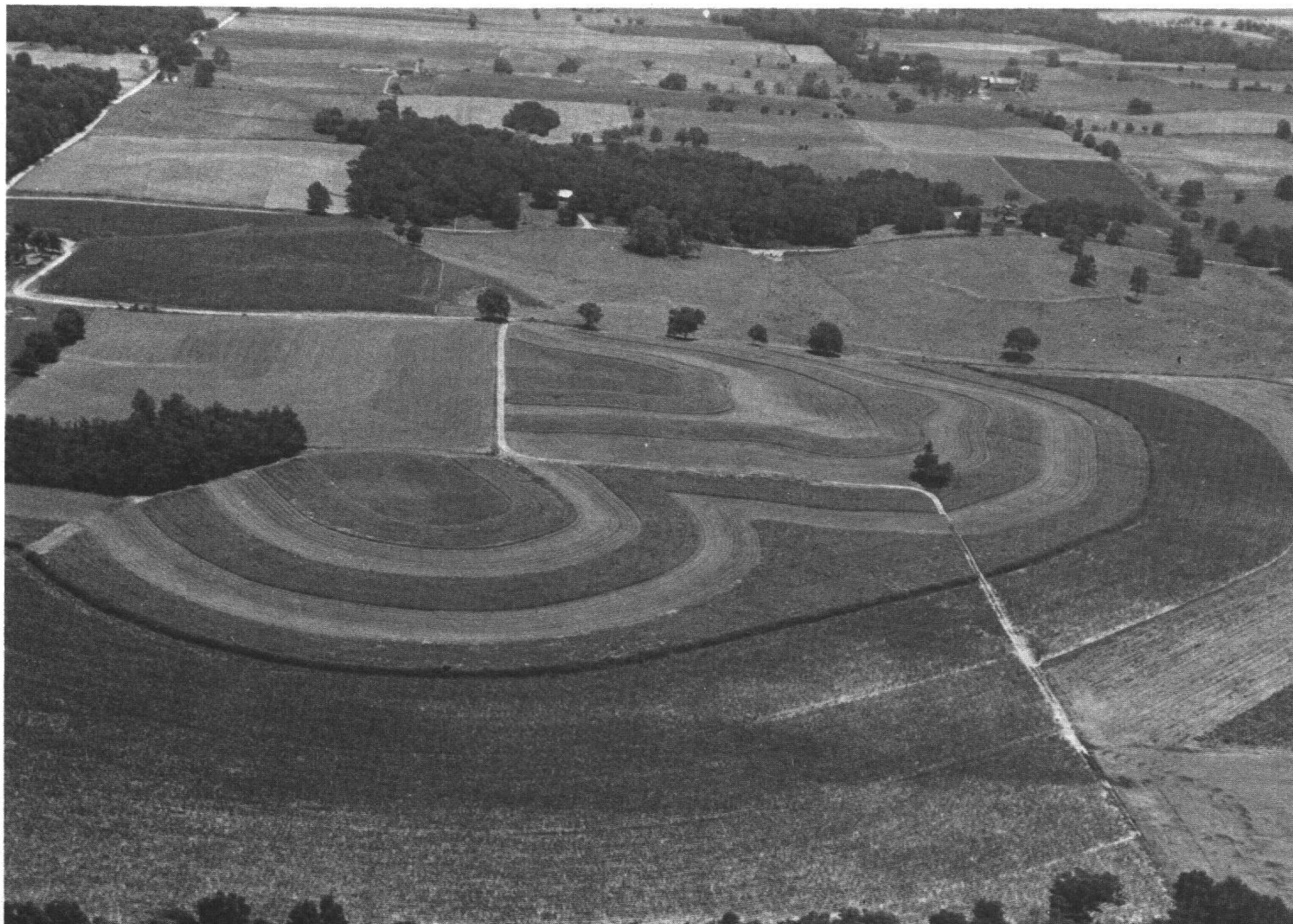
SOIL SURVEY OF

Clark and Floyd Counties, Indiana



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Purdue University Agricultural Experiment Station

Issued August 1974

Major fieldwork for this soil survey was done in the period 1963–67. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1967. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Clark County and the Floyd County Soil and Water Conservation Districts.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Clark and Floyd Counties are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the counties in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the woodland suitability group and the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and the woodland suitability groups.

Foresters and others can refer to the subsection "Woodland," where the soils of the counties are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the subsection "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the subsections "Engineering Uses of the Soils" and "Recreation."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation, Morphology, and Classification of the Soils."

Newcomers in Clark and Floyd Counties may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the counties given in the section "General Nature of the Area."

Cover: Contour stripcropping southeast of Sellersburg, Indiana. The soil is Crider silt loam, 6 to 12 percent slopes, eroded.

U.S. GOVERNMENT PRINTING OFFICE: 1974

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

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Issued August 1974

SOIL SURVEY OF CLARK AND FLOYD COUNTIES, INDIANA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

CLARK AND FLOYD COUNTIES are in the southeastern part of Indiana (fig. 1). These counties have a total area of 341,120 acres, or 533 square miles. Jeffersonville, the county seat of Clark County, is in the extreme southern tip of the county. New Albany, the county seat of Floyd County, is in the extreme southeastern part of the county. Distance between the two cities is about 3 miles on an east-west line. Clarksville, in Clark County, is between the two. The Ohio River forms the southern boundary of the two counties and is also the State line between Indiana and Kentucky.

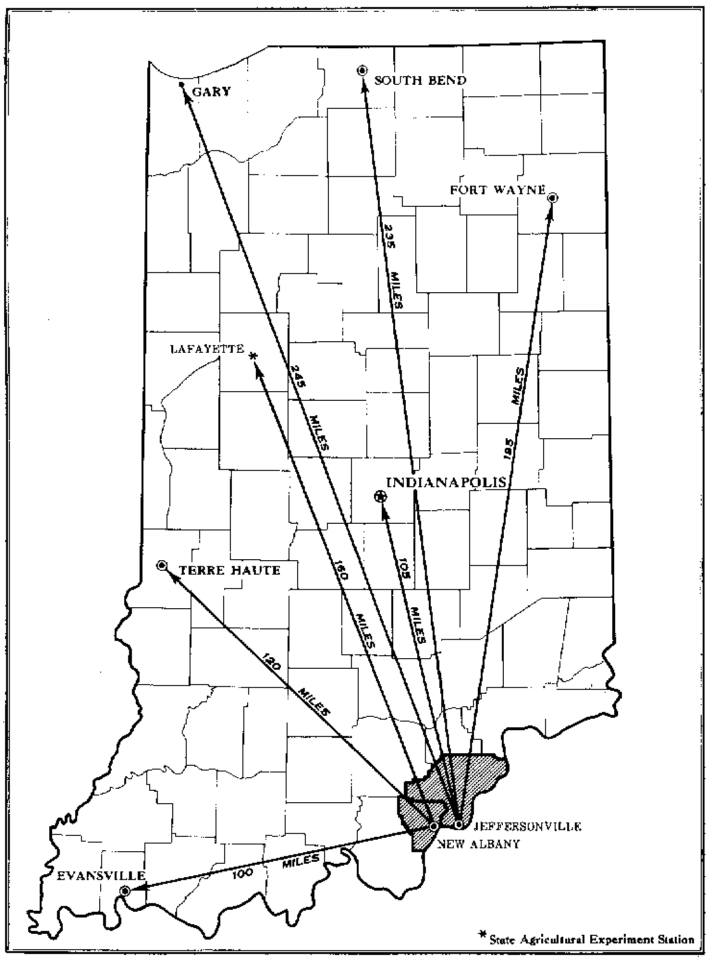

Figure 1.—Location of Clark and Floyd Counties in Indiana.

The climate of the counties provides for ample precipitation and favorable temperature for farming. The physiography comprises broad terraces and bottom lands near the Ohio River, in the southern part of the area, and nearly level to extremely steep uplands in the other part. The survey area is drained by many streams tributary to the Ohio River. The main streams are Indian Creek in Floyd County and Muddy Fork and Fourteenmile Creeks in Clark County. Silver Creek contributes to the drainage of both counties.

Farming is an important source of income in the area. Corn and soybeans are the main crops, and livestock is raised for meat and dairy products. Woodland makes up a large part of the area and offers a high potential to wood-using industries. Numerous industries are important in the area.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Clark and Floyd Counties, where they are located, and how they can be used. The soil scientists went into the counties knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* (*8*) [1]

[1] Italic numbers in parentheses refer to Literature Cited, p. 98.

are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Bedford and Cincinnati, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Cincinnati silt loam, 2 to 6 percent slopes, eroded, is one of several phases within the Cincinnati series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gullied land is a land type in Clark and Floyd Counties.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and rangeland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Clark and Floyd Counties. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a survey area, who want to compare different parts of a survey area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The seven soil associations in Clark and Floyd Counties are discussed in the following pages.

1. Crider-Grayford association

Deep, well-drained, nearly level to steep soils that have a medium-textured to fine-textured subsoil; over limestone on uplands

This association consists mainly of gently sloping to strongly sloping soils on uplands. It occupies approximately 35 percent of the survey area. There are numerous sinkholes throughout the area. About 56 percent of the association is Crider soils, about 21 percent is Grayford soils, and the remaining 23 percent is minor soils.

Crider soils are nearly level to strongly sloping, well-drained soils that formed in loess and material weathered from limestone. Their surface layer is dark brown to dark grayish brown. They have a red subsoil. Limestone bedrock is at a depth of about 5 feet. In Floyd County there are numerous chert fragments in the lower part of the subsoil of some Crider soils.

Grayford soils are nearly level to strongly sloping, well-drained soils that formed in loess and glacial till and material weathered from limestone. They are mainly in the northeastern part of Clark County. Their surface layer is dominantly dark brown. They have a yellowish-red subsoil. Limestone bedrock is at a depth of about 6 feet.

Among the less extensive soils in this association are the nearly level to strongly sloping soils of the Hosmer series in the southern part of Clark County and the sloping to steep soils of the Hagerstown series. There are small areas of gently sloping Bedford soils, mainly in Floyd County. Hosmer, Hagerstown, and Bedford soils consist mainly of deep, well drained and moderately well drained soils. In the northeastern part of Clark County there are small areas of well drained Cincinnati and

moderately well drained Rossmoyne soils that formed in loess and till. There are narrow flood plains that dissect the association. These soils are well drained to somewhat poorly drained.

About 80 percent of this association is in cultivation. The main crops are corn, soybeans, small grain, hay, and pasture. Truck crops, such as cucumbers, sweet corn, snapbeans, strawberries, cantaloups, and tomatoes, are also grown. About 15 percent is in forest, and about 5 percent is in urban areas. These soils are suited to most of the crops commonly grown in the area.

Erosion and runoff are the main hazards in use and management of these soils. Where there are sinkholes, mechanical practices used to control erosion are impractical. Vegetative or cultural methods are necessary in these areas. In many areas farm ponds are hard to establish, because of crevices in the limestone bedrock that permit water seepage.

2. *Cincinnati-Trappist association*

Deep and moderately deep, well-drained, gently sloping to strongly sloping soils that have a medium-textured to fine-textured subsoil; over shale on uplands

This association consists of gently sloping to strongly sloping soils overlying shale. It occupies approximately 13 percent of the survey area. About 36 percent of the association is Cincinnati soils, about 33 percent is Trappist soils, and 31 percent is less extensive soils.

Cincinnati soils are gently sloping to strongly sloping, deep, well-drained soils that formed in loess and glacial till over shale. Their surface layer is dominantly dark brown, and their subsoil is strong brown or yellowish brown. A fragipan that restricts the downward movement of water is at a depth of about 2 feet. These soils are leached free of carbonates to a depth of 10 feet or more.

Trappist soils are sloping to strongly sloping, well-drained soils that formed in loess and material weathered from black shale. Their surface layer is dominantly dark yellowish brown, and their subsoil is strong brown. Depth to black shale bedrock is about 3 feet. In some places a thin layer of glacial till is between the loess and material weathered from black shale.

Among the less extensive soils in this association are the well-drained, sloping to strongly sloping Rarden soils and the excessively drained, steep to extremely steep Rockcastle soils. Small areas of these two soils are in the north-central part of Clark County and near the base of the "Knobs" in both Clark and Floyd Counties. These soils formed in loess and material weathered from neutral, gray-green shale. Depth to shale is less than 40 inches.

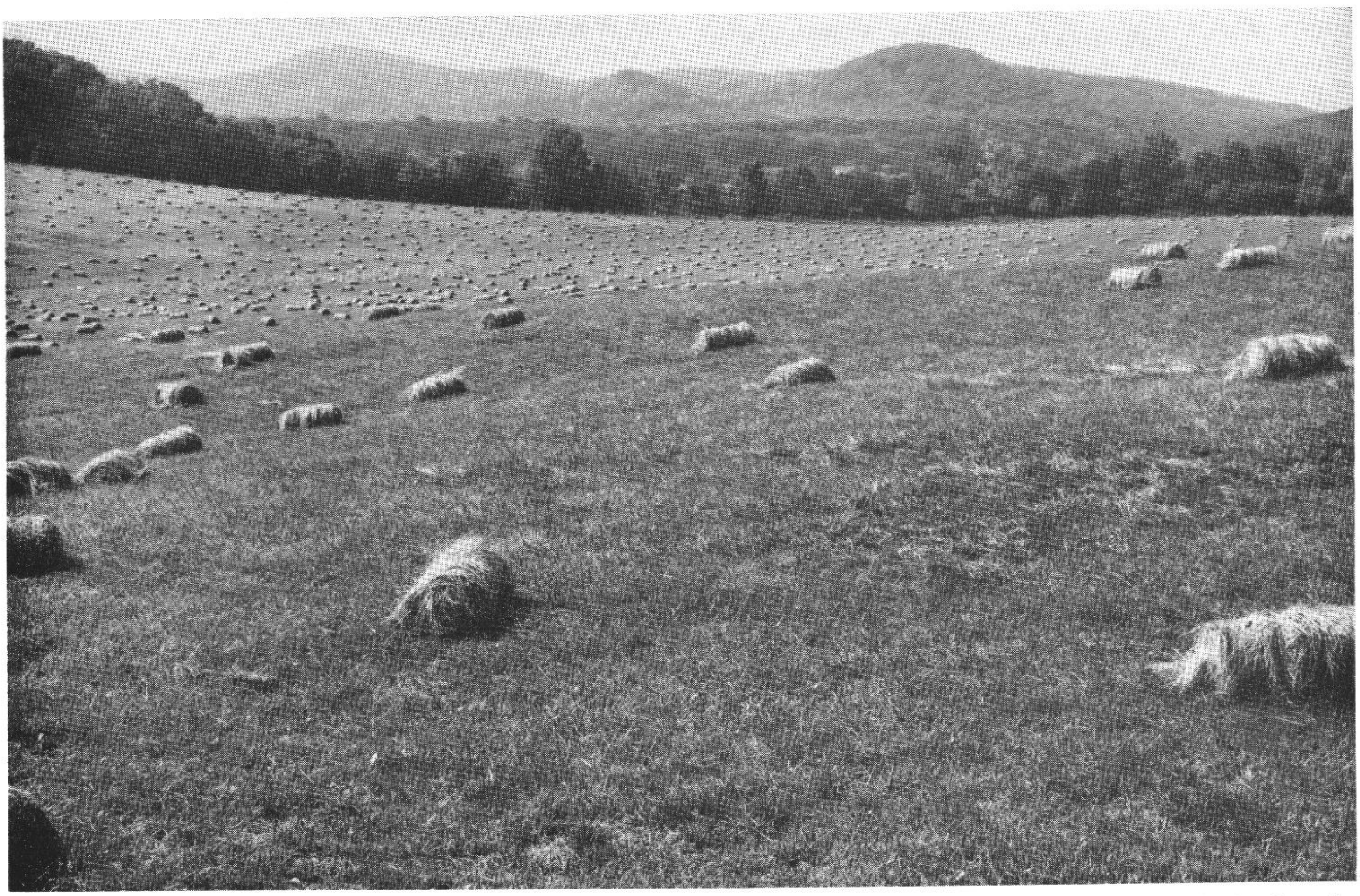

Figure 2.—**Field of Kentucky 31 tall fescue on Cincinnati silt loam, 6 to 12 percent slopes, severely eroded. These round bales from the second cutting will remain in the field for winter forage. Background shows part of the "Knobs" area.**

There are also small areas of nearly level and gently sloping, moderately well drained Rossmoyne soils and nearly level to strongly sloping, well drained Hosmer and Jennings soils. All of these soils have a fragipan at a depth of about 2 feet. There are many narrow flood plains that dissect this association and these soils are well drained to somewhat poorly drained.

About 70 percent of this association is in cultivation. The main crops are corn, soybeans, small grain, pasture, and hay (fig. 2, p. 3). About 25 percent is in forest, and about 5 percent is in urban areas. Although natural fertility is low, these soils respond well to lime and fertilizer.

Erosion and runoff are the main hazards in use and management of these soils. Limitations affecting use and management include a shallow root zone in soils that have a fragipan and in soils that have shale near the surface.

3. Zanesville-Gilpin-Rarden association

Moderately deep and deep, well drained and moderately well drained, gently sloping to steep soils that have a medium-textured to fine-textured subsoil; over sandstone, siltstone, and shale on uplands

This association consists mainly of sloping to strongly sloping soils on hillsides and ridges. The soils formed in thin loess and sandstone, siltstone, and shale. The association occupies approximately 22 percent of the survey area. Most of this association is known geographically as the "Knobs" area of Clark and Floyd Counties (fig. 2). About 24 percent of the association is Zanesville soils, about 18 percent is Gilpin soils, about 17 percent is Rarden soils, and the rest is less extensive soils.

Zanesville soils are gently sloping to strongly sloping, deep, well drained to moderately well drained soils that formed in material weathered from brown sandstone, siltstone, and shale. Their surface layer is yellowish brown and is medium textured. Their subsoil is yellowish brown to light gray. At a depth of about 2 feet there is a slowly permeable fragipan that restricts the downward movement of water.

Gilpin soils are sloping to steep, moderately deep, well-drained soils that formed in material weathered from brown sandstone, siltstone, and shale. Their surface layer is dominantly brown and medium textured. Their subsoil is yellowish brown. Bedrock is at a depth of about 2½ feet.

Rarden soils are sloping and strongly sloping, moderately deep, well-drained soils that formed in material weathered from neutral, gray-green shale, locally known as "soapstone." Their surface layer is brown and medium textured. Their subsoil is strong brown to yellowish red. Shale is at a depth of about 3 feet.

Among the less extensive soils in this association are the shallow, excessively drained Weikert and Colyer soils that are steep to extremely steep. Smaller areas of moderately deep, excessively drained, steep to extremely steep Berks and Rockcastle soils are also in this association.

About 70 percent of this association is in woodlands; much of this is in the Clark County State Forest. Hardwood trees grow slowly on these soils. Part of the association has been cleared and reforested to pine. Virginia pine is suited to these soils. Most of the remaining 30 percent of the association consists of small, scattered areas that are in corn, hay, and pasture. Some areas that were formerly cultivated have been abandoned and are now reverting to trees.

Erosion and runoff are the main hazards on these soils, especially where woodland has been cleared for other uses. Erosion and runoff are hazards on roads and logging trails within the forested areas. By using erosion control practices and good management, several thousand acres of this association could be developed into good pasture. Major roads follow ridgetops or drainageways.

4. Wheeling-Markland-Huntington association

Deep, well drained and moderately well drained, nearly level to steep soils that have a medium-textured to fine-textured subsoil; on terraces and flood plains

This association consists mainly of nearly level to strongly sloping soils on terraces and flood plains. The association occupies approximately 8 percent of the survey area. About 31 percent of the association is Wheeling soils, about 16 percent is Markland soils, about 12 percent is Huntington soils, and the rest is less extensive soils.

Wheeling soils are nearly level to strongly sloping, deep, well-drained soils on terraces along the Ohio River. Their surface layer is dominantly dark yellowish brown and is medium textured or moderately coarse textured. They have a dark-brown subsoil. These soils are subject to occasional flooding from the Ohio River.

Markland soils are sloping to steep, deep, and well drained to moderately well drained. They are on slack-water terrace breaks near the mouth of Silver Creek and other large streams, mostly in Floyd County. Their surface layer is mostly light yellowish brown and is medium textured. They have an olive-brown subsoil. Calcareous material is at a depth of about 3 feet.

Huntington soils are nearly level, deep, well drained, and medium textured. They occur on flood plains along the Ohio River. They are neutral and dominantly have a dark-brown surface layer and a brown or dark yellowish-brown subsoil. These soils are subject to annual flooding.

Among the less extensive soils in this association are the well drained to moderately well drained Uniontown soils and the somewhat poorly drained Henshaw soils on slack-water terraces. Small areas of moderately well drained Lindside soils and somewhat poorly drained Newark soils are on flood plains along the Ohio River. A few large areas of very poorly drained Montgomery and Zipp soils are north of Clarksville in Clark County.

About 50 percent of this association is in cultivation. The main crops are corn and soybeans. Some small grain and hay crops are also grown. Some of the more poorly drained areas have remained in woods. Most of the remaining 50 percent of this association is in the urban areas around the towns of Jeffersonville, Clarksville, and New Albany.

Erosion and runoff are the main hazards on the sloping soils. Flooding is a hazard in many places. Wetness is the main limitation in the nearly level and depressional areas.

5. Bartle-Wakeland-Haymond association

Deep, somewhat poorly drained and well-drained, nearly level soils that have a medium-textured to moderately fine textured subsoil; on terraces and flood plains

This association consists mainly of nearly level soils on terraces and flood plains along most of the tributaries of the Ohio River. The association occupies approximately 7 percent of the survey area. About 29 percent of the association is Bartle soils, about 16 percent is Wakeland soils, about 16 percent is Haymond soils, and the rest is less extensive soils.

Bartle soils are nearly level, deep, somewhat poorly drained soils that formed in loess over alluvial deposits of stratified silt loam and silty clay loam materials on terraces. Their surface layer is dominantly brown. Their subsoil is mottled with gray. A fragipan at a depth of about 2 feet slows the downward movement of water. These soils are subject to occasional flooding.

Wakeland soils are nearly level, deep, medium-textured, somewhat poorly drained soils of the bottom lands. They are medium acid. Their surface layer is dominantly grayish brown. Their subsoil is mottled with gray. These soils are subject to frequent flooding.

Haymond soils are nearly level, deep, medium-textured, well-drained soils on bottom lands. They are medium acid. Their surface layer is dominantly dark grayish brown. Their subsoil is dark brown. These soils are subject to frequent flooding.

Among the less extensive soils in this association are small areas of bottom-land and terrace soils, including the deep, medium-textured, moderately well drained Wilbur and Pekin soils. The well-drained Pope soils occupy small areas along streams that flow out of the "Knobs" area.

The soils in this association are primarily in cultivation. Even the bottom lands that are frequently flooded are mostly in row crops, although flooding during the growing season occasionally destroys a crop. Corn is the main crop, but soybeans, small grain, and hay are also grown. A few small areas are in pasture. Some of the more poorly drained areas have remained in woods.

Flooding is the major hazard on the soils of the bottom lands. The main limitation on the terrace soils is wetness.

6. Avonburg-Rossmoyne association

Deep, somewhat poorly drained and moderately well drained, nearly level and gently sloping soils that have a medium-textured to moderately fine textured subsoil; formed in loess and glacial till on uplands

This association consists mainly of nearly level and gently sloping upland soils formed in loess and glacial till. It occupies approximately 10 percent of the survey area. About 43 percent of the association is Avonburg soils, about 19 percent is Rossmoyne soils, and the rest is less extensive soils.

Avonburg soils are nearly level and gently sloping soils on broad ridgetops. These are somewhat poorly drained soils. They have a slowly permeable fragipan at a depth of about 2 feet that restricts the downward movement of water. The surface layer is dominantly dark grayish brown and is medium textured. The subsoil is mottled with gray.

Rossmoyne soils are nearly level and gently sloping, moderately well drained soils on narrow breaks below Avonburg soils. They have a slowly permeable fragipan at a depth of 2 feet. Their surface layer is dominantly brown or dark brown and is medium textured. Their subsoil is mottled with gray.

The remaining 38 percent of this association consists mainly of nearly level Clermont soils on broad ridgetops. These are poorly drained soils that have a slowly permeable fragipan at a depth of about 2 feet. There are also small areas of deep, well-drained Cincinnati and Grayford soils and deep, well-drained to somewhat poorly drained soils on narrow flood plains.

All of these soils are generally leached free of carbonates to a depth of generally more than 10 feet. The areas west of Fourteenmile Creek are underlain by black shale, and the areas to the east are underlain by limestone.

Most of this association is in cultivation. About 70 percent is in corn and soybeans. The other 30 percent is in small grain and legume-grass hay and pasture. These soils are among the most productive upland soils in the area. Their natural fertility is low. The soils in this association that overlie limestone seem to be slightly more productive than the same soils underlain by black shale. The largest farms in the survey are in this association.

Erosion and runoff are the major hazards in the sloping areas that are in cultivation. Wetness is the main limitation in the nearly level areas. The fragipan slows the downward movement of water.

7. Corydon-Fairmount association

Shallow, excessively drained, strongly sloping to extremely steep soils that have a fine-textured subsoil; over limestone on uplands

This association consists mainly of steep to extremely steep soils over limestone on uplands. It occupies approximately 5 percent of the survey area. About 53 percent of the association is Corydon soils, about 29 percent is Fairmount soils, and the rest is less extensive soils.

Corydon soils are strongly sloping to extremely steep, shallow, excessively drained soils formed in material weathered from limestone. Their surface layer is dark brown. Depth to limestone bedrock is less than 20 inches. Fragments of limestone are on the surface and throughout the soil. In some places there is a thin layer of clay subsoil, and, in other places, the topsoil is directly on top of bedrock. The soil is neutral to alkaline. The limestone bedrock commonly has many cracks and crevices.

Fairmount soils are strongly sloping to extremely steep, shallow, excessively drained soils formed in material weathered from interbedded limestone and calcareous clay shales. There are generally numerous fossils imbedded in the limestone bedrock. The surface layer of these soils is dominantly dark brown or dark yellowish brown, and their subsoil is yellowish brown. Depth to limestone bedrock is less than 20 inches. Fragments of limestone are on the surface and throughout the soil. In some places there is a thin layer of clay subsoil, and, in other places, the topsoil is directly on top of bedrock. This soil is neutral to alkaline and is exceptionally high in phosphate content. Fairmount soils are on slopes at lower elevations in the eastern part of Clark County. They occupy the same gradients of slope as Corydon soils

and are adjacent to, but downslope from, the Corydon soils.

Among the less extensive soils in this association are the deep, well-drained, sloping and strongly sloping Crider soils on ridges and slope breaks above Corydon and Fairmount soils. Deep, well-drained Haymond soils are on narrow flood plains along the tributaries to the Ohio River and deep, well-drained Huntington soils are on flood plains along the Ohio River. Small areas of these Haymond and Huntington soils are included in this association.

Most of this association is not suited to intensive cultivation, because the soils are too steep and shallow. Most of the cultivated areas are on ridgetops or in small areas on flood plains along streams. Cultivation was attempted in the past in many of the steep areas because of the high level of natural fertility in these soils. However, by using fertilizer on other soils that are more nearly level, farmers found the steep soils of this association to be the least productive. Many of these steep areas were abandoned and allowed to revert to woodland. This association is now about 80 percent woodland. Some of the species, such as cedar and honeylocust, are undesirable. Most of the remaining 20 percent is in hay and pasture or is idle.

Erosion and runoff are the main hazards on these soils. By using erosion control practices and good management, much of this association could be developed into good pasture.

There are few good roads in this association.

Descriptions of the Soils

This section describes the soil series and mapping units of Clark and Floyd Counties. The approximate acreage and proportionate extent of each mapping unit are given in table 1.

In the pages that follow, a general description of each soil series is given. Each series description has a detailed description of a profile, representative of the series and a brief statement of the range in characteristics of the soils in the series as mapped in these counties. Following the series description, each mapping unit in the series is described individually. For full information on any one mapping unit it is necessary to read the description of the soil series as well as the description of the mapping unit. Miscellaneous land types, such as Gullied land, are described in alphabetic order along with the soil series.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Clark County		Floyd County	
	Acres	Percent	Acres	Percent
Avonburg silt loam, 0 to 2 percent slopes	10, 645	4. 3	3, 505	3. 6
Avonburg silt loam, 2 to 4 percent slopes	800	. 3	200	. 2
Bartle silt loam	5, 000	2. 1	2, 220	2. 3
Bedford silt loam, 0 to 2 percent slopes	800	. 3	150	. 2
Bedford silt loam, 2 to 6 percent slopes	5, 000	2. 1	1, 100	1. 2
Berks channery silt loam, 18 to 35 percent slopes	4, 000	1. 6	2, 550	2. 6
Bonnie silt loam	500	. 2	50	. 1
Cincinnati silt loam, 2 to 6 percent slopes, eroded	500	. 2	250	. 3
Cincinnati silt loam, 6 to 12 percent slopes, eroded	5, 000	2. 1	3, 090	3. 2
Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	3, 000	1. 2	1, 200	1. 2
Cincinnati silt loam, 12 to 18 percent slopes, eroded	1, 000	. 4	660	. 7
Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	1, 500	. 6	780	. 8
Clermont silt loam	3, 800	1. 6	200	. 2
Colyer shaly silt loam, 18 to 35 percent slopes	8, 000	3. 5	780	. 8
Corydon stony silt loam, 12 to 25 percent slopes	1, 200	. 5	980	1. 0
Corydon stony silt loam, 25 to 70 percent slopes	4, 000	1. 6	3, 150	3. 2
Crider silt loam, 0 to 2 percent slopes	1, 500	. 6	550	. 6
Crider silt loam, 2 to 6 percent slopes, eroded	7, 450	3. 0	7, 000	7. 5
Crider silt loam, 2 to 6 percent slopes, severely eroded	1, 540	. 6	1, 500	1. 6
Crider silt loam, 6 to 12 percent slopes, eroded	8, 110	3. 3	8, 000	8. 6
Crider silt loam, 6 to 12 percent slopes, severely eroded	6, 645	2. 8	4, 465	4. 7
Crider silt loam, 12 to 18 percent slopes, eroded	4, 070	1. 6	4, 000	4. 2
Crider silt loam, 12 to 18 percent slopes, severely eroded	6, 730	2. 8	6, 000	6. 4
Fairmount silty clay loam, 12 to 25 percent slopes	1, 000	. 4	0	----------
Fairmount stony silty clay loam, 25 to 70 percent slopes	4, 000	1. 6	0	----------
Gilpin silt loam, 6 to 12 percent slopes, eroded	1, 290	. 5	800	. 9
Gilpin silt loam, 6 to 12 percent slopes, severely eroded	500	. 2	320	. 3
Gilpin silt loam, 12 to 18 percent slopes, eroded	3, 000	1. 2	2, 190	2. 3
Gilpin silt loam, 12 to 18 percent slopes, severely eroded	1, 800	. 7	1, 210	1. 3
Gilpin silt loam, 18 to 25 percent slopes, eroded	1, 200	. 5	810	. 9
Grayford silt loam, 0 to 2 percent slopes	1, 500	. 6	0	----------
Grayford silt loam, 2 to 6 percent slopes, eroded	5, 040	2. 0	0	----------
Grayford silt loam, 6 to 12 percent slopes, eroded	6, 000	2. 5	0	----------
Grayford silt loam, 6 to 12 percent slopes, severely eroded	4, 000	1. 6	0	----------
Grayford silt loam, 12 to 18 percent slopes, eroded	4, 500	1. 8	0	----------
Grayford silt loam, 12 to 18 percent slopes, severely eroded	2, 850	1. 2	0	----------
Grayford silt loam, 18 to 25 percent slopes, eroded	1, 660	. 7	0	----------

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Clark County		Floyd County	
	Acres	Percent	Acres	Percent
Gullied land	1, 000	. 4	570	. 6
Hagerstown silt loam, 6 to 12 percent slopes, eroded	700	. 3	800	. 8
Hagerstown silt loam, 12 to 18 percent slopes, eroded	700	. 3	700	. 7
Hagerstown silt loam, 18 to 25 percent slopes, eroded	800	. 3	980	1. 1
Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	700	. 3	800	. 8
Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded	500	. 2	500	. 5
Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded	310	. 1	300	. 3
Haymond silt loam	3, 000	1. 2	1, 080	1. 0
Henshaw silt loam, 0 to 2 percent slopes	2, 200	. 9	980	1. 0
Hickory silt loam, 18 to 25 percent slopes, eroded	2, 200	. 9	130	. 1
Hosmer silt loam, 0 to 2 percent slopes	1, 150	. 5	0	
Hosmer silt loam, 2 to 6 percent slopes, eroded	1, 600	. 7	0	
Hosmer silt loam, 6 to 12 percent slopes, eroded	2, 560	1. 0	0	
Hosmer silt loam, 6 to 12 percent slopes, severely eroded	1, 500	. 6	0	
Hosmer silt loam, 12 to 18 percent slopes, eroded	2, 000	. 8	0	
Huntington silt loam	2, 000	. 8	1, 510	1. 6
Jennings silt loam, 0 to 2 percent slopes	1, 500	. 6	200	. 2
Jennings silt loam, 2 to 6 percent slopes, eroded	3, 000	1. 2	430	. 5
Jennings silt loam, heavy subsoil variant, 2 to 6 percent slopes, eroded	1, 800	. 7	500	. 5
Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, eroded	3, 000	1. 2	1, 020	1. 1
Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, severely eroded	1, 500	. 6	500	. 8
Jennings silt loam, heavy subsoil variant, 12 to 18 percent slopes, eroded	1, 100	. 4	410	. 4
Johnsburg silt loam, 0 to 2 percent slopes	1, 200	. 5	390	. 4
Lindside silt loam	800	. 3	770	. 8
Markland silt loam, 6 to 12 percent slopes, eroded	1, 100	. 5	400	. 4
Markland silt loam, 12 to 18 percent slopes, eroded	1, 500	. 6	600	. 6
Markland silt loam, 18 to 25 percent slopes, eroded	700	. 3	300	. 3
Montgomery silty clay	1, 020	. 4	0	
Newark silt loam	650	. 3	600	. 6
Pekin silt loam 2 to 6 percent slopes, eroded	2, 000	. 8	890	. 9
Pits	700	. 3	100	. 1
Pope silt loam	1, 500	. 6	530	. 6
Rarden silt loam, 6 to 12 percent slopes, eroded	3, 530	1. 4	500	. 5
Rarden silt loam, 12 to 18 percent slopes, eroded	3, 500	1. 4	500	. 5
Rarden silty clay loam, 6 to 12 percent slopes, severely eroded	1, 700	. 7	300	. 3
Rarden silty clay loam, 12 to 18 percent slopes, severely eroded	2, 100	. 9	400	. 4
Rockcastle silt loam, 18 to 55 percent slopes	5, 000	2. 0	530	. 6
Rossmoyne silt loam, 0 to 2 percent slopes	900	. 4	100	. 1
Rossmoyne silt loam, 2 to 6 percent slopes, eroded	4, 500	1. 8	500	. 5
Rossmoyne silt loam, 2 to 6 percent slopes, severely eroded	1, 000	. 4	100	. 1
Trappist silt loam, 6 to 12 percent slopes, eroded	5, 010	2. 1	1, 000	1. 1
Trappist silt loam, 6 to 12 percent slopes, severely eroded	2, 500	1. 0	500	. 5
Trappist silt loam, 12 to 18 percent slopes, eroded	2, 500	1. 0	710	. 8
Trappist silt loam, 12 to 18 percent slopes, severely eroded	2, 700	1. 1	400	. 4
Uniontown silt loam, 2 to 6 percent slopes, eroded	1, 500	. 6	250	. 3
Uniontown silt loam, 6 to 12 percent slopes, eroded	1, 700	. 7	210	. 2
Wakeland silt loam	3, 500	1. 4	500	. 5
Weikert channery silt loam, 35 to 90 percent slopes	7, 000	3. 0	4, 610	4. 7
Weinbach silt loam, 0 to 2 percent slopes	1, 400	. 6	160	. 2
Wheeling fine sandy loam, 2 to 6 percent slopes, eroded	1, 080	. 4	0	
Wheeling fine sandy loam, 6 to 12 percent slopes, eroded	420	. 2	0	
Wheeling silt loam, 0 to 2 percent slopes	3, 000	1. 2	720	. 8
Wheeling silt loam, 2 to 6 percent slopes, eroded	1, 700	. 7	300	. 3
Wheeling silt loam, 6 to 12 percent slopes, eroded	500	. 2	280	. 3
Wheeling silt loam, 12 to 18 percent slopes, eroded	500	. 2	130	. 1
Wilbur silt loam	2, 000	. 8	1, 440	1. 5
Zanesville silt loam, 2 to 6 percent slopes, eroded	2, 500	1. 0	1, 580	1. 7
Zanesville silt loam, 2 to 6 percent slopes, severely eroded	600	. 2	430	. 4
Zanesville silt loam, 6 to 12 percent slopes, eroded	4, 000	1. 6	3, 010	3. 1
Zanesville silt loam, 6 to 12 percent slopes, severely eroded	2, 300	. 9	1, 700	1. 7
Zanesville silt loam, 12 to 18 percent slopes, eroded	600	. 2	400	. 4
Zanesville silt loam, 12 to 18 percent slopes, severely eroded	600	. 2	400	. 4
Zipp silty clay	600	. 2	0	
Water	200	. 1	0	
Total	245, 760	100. 0	95, 360	100. 0

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. At the end of the description of each mapping unit are listed the capability unit and the woodland group in which the mapping unit has been placed. The page where each of these groups is described can be found in the "Guide to Mapping Units." Colors given are for moist soil unless otherwise stated.

For more general information about the soils, the reader can refer to the section "General Soil Map," in which the broad patterns of soils are described. Many of the terms used in the soil descriptions and other parts of the survey are defined in the Glossary.

Avonburg Series

The Avonburg series consists of deep, somewhat poorly drained soils on uplands. These soils have a slowly permeable fragipan. They are nearly level where they occupy broad ridges and gently sloping where they occupy breaks. They formed in loess and the underlying loam or clay loam glacial till. Below the till is limestone or shale bedrock.

In a representative profile, the surface layer is about 10 inches of dark grayish-brown, neutral silt loam. The subsurface layer is about 3 inches of light yellowish-brown, slightly acid silt loam that has light brownish-gray mottles. The subsoil is more than 63 inches thick and has yellowish-brown mottles. The upper 11 inches is light brownish-gray, strongly acid, friable silt loam. The middle 40 inches is a gray, very strongly acid, very firm and brittle, heavy silt loam and light clay loam fragipan. The lower part is yellowish-brown, strongly acid, friable loam.

Avonburg soils have moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid if not limed. Surface runoff is slow.

Representative profile of Avonburg silt loam, 0 to 2 percent slopes, in a cultivated field, where the slope is 1 percent, 2,250 feet northeast of the southwest corner and 125 feet northwest of the south boundary of Clark Grant 245 in Clark County:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; many small roots; neutral; abrupt, smooth boundary.

A2—10 to 13 inches, light yellowish-brown (10YR 6/4) silt loam; many, medium, faint, light brownish-gray (10YR 6/2) mottles; weak, medium, platy structure; friable when moist; common small roots; vesicular; slightly acid; clear, smooth boundary.

B1—13 to 24 inches, light brownish-gray (10YR 6/2) silt loam; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable when moist; few small roots; vesicular; strongly acid; clear, irregular boundary.

Bx1t—24 to 41 inches, gray (10YR 6/1) heavy silt loam; many, coarse, distinct, brownish-yellow (10YR 6/6) and yellowish-brown (10YR 5/6) mottles; strong, coarse, prismatic structure; very firm and brittle when moist; thin, light-gray (10YR 7/1) silt films on all prismatic peds; many light-gray (10YR 7/1) silt flows in root and crayfish channels; thin, discontinuous, gray (10YR 6/1) clay films on peds and on few void linings; very strongly acid; gradual, wavy boundary.

IIBx2t—41 to 64 inches, gray (10YR 6/1) light clay loam; many, coarse, distinct, yellowish-brown (10YR 5/6–5/8) mottles; strong, very coarse, prismatic structure; very firm and brittle when moist; light-gray (10YR 7/1) silt films on all peds; thin, discontinuous, gray (10YR 6/1) clay films on many peds; few iron and manganese concretions; few pebbles; very strongly acid; gradual, wavy boundary.

IIB3—64 to 76 inches, yellowish-brown (10YR 5/6) loam; many, coarse, distinct, gray (10YR 6/1) mottles; massive; friable when moist; thin, gray (10YR 6/1), discontinuous clay films on very few peds; few till pebbles; few iron and manganese concretions; strongly acid.

The solum ranges from 55 to 84 inches in thickness. Loess ranges from 30 to 50 inches in thickness. Depth to the fragipan ranges from 22 to 30 inches. Depth to limestone or shale bedrock ranges from 60 inches to more than 10 feet. The Ap horizon is dark grayish brown (10YR 4/2) to dark brown (10YR 4/3). It is strongly acid to neutral, depending on the amount of lime applied. If no lime is used, it is medium acid or strongly acid.

The Bx horizon has matrix colors of gray (10YR 5/1) to light brownish gray (10YR 6/2) and is strongly acid or very strongly acid. The B3 horizon has matrix colors of gray (10YR 5/1) to yellowish brown (10YR 5/6) and is loam to clay loam. Consistence is friable or firm, and reaction is slightly acid to strongly acid.

Avonburg soils formed in materials similar to those in which the Clermont and Rossmoyne soils formed. They are on slopes adjacent to both of these soils, are browner in the upper part of the subsoil than the Clermont soils, and have more gray mottling in the upper part of their subsoil than the Rossmoyne soils.

Avonburg silt loam, 0 to 2 percent slopes (AvA).—This soil occupies broad ridges. It has the profile described as representative for the series. Included in mapping were a few small areas of deep, poorly drained Clermont soils and of deep, moderately well drained Rossmoyne soils. Also included were areas of a soil that has little or no till in the subsoil and is about 60 inches deep over shale.

This soil is well suited to corn and soybeans. Runoff is slow, and wetness is the main limitation. (Capability unit IIw–3; woodland suitability group 5)

Avonburg silt loam, 2 to 4 percent slopes (AvB).—This soil occupies breaks between nearly level ridges and sloping hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is light yellowish brown and is 4 to 9 inches thick. Included in mapping were areas of nearly level Avonburg soils and a few small areas of deep, moderately well drained Rossmoyne soils.

This soil is well suited to corn and soybeans. Wetness is the main limitation. Erosion and runoff are hazards. Some areas of this soil at the heads of drainageways accumulate runoff water from upland soils that are adjacent to, but higher than, this soil. (Capability unit IIw–3; woodland suitability group 5)

Bartle Series

The Bartle series consists of deep, nearly level, somewhat poorly drained soils that have a slowly permeable fragipan. These soils are on broad terraces between upland soils and bottom-land soils along most of the larger streams. They formed in stratified material and water-laid silty sediments.

In a representative profile, the surface layer is about 11 inches of brown, neutral silt loam that has gray mottles. The subsurface layer is about 3 inches of light-

gray, slightly acid silt loam that has yellowish-brown mottles. The subsoil is about 53 inches thick, has yellowish-brown and light-gray mottles, and is strongly acid. The upper 8 inches is pale-brown, friable silt loam. The lower part is a yellowish-brown, very firm and brittle light silty clay loam fragipan. The underlying material is brownish-yellow, strongly acid, very friable, stratified silt loam and silty clay loam that has gray mottles.

Bartle soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid if not limed. Surface runoff is slow.

Representative profile of Bartle silt loam in a cultivated field, 2,500 feet southeast of the northwest corner and 1,500 feet northeast of the west boundary of Clark Grant 236 in Clark County:

Ap—0 to 11 inches, brown (10YR 5/3) silt loam; few, fine, distinct, gray (10YR 6/1) mottles; moderate, medium, granular structure; friable when moist; many small roots; neutral; abrupt, smooth boundary.

A2—11 to 14 inches, light-gray (10YR 7/1) silt loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; weak, coarse, subangular blocky structure; friable when moist; few small roots; slightly acid; gradual, irregular boundary.

B1—14 to 22 inches, pale-brown (10YR 6/3) silt loam; many, medium, distinct, yellowish-brown (10YR 5/8) and light-gray (10YR 7/1) mottles; weak, coarse, subangular blocky structure; friable when moist; strongly acid; gradual, irregular boundary.

Bx1t—22 to 27 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/8) and light-gray (10YR 7/1) mottles; moderate, coarse, prismatic structure breaking into moderate, coarse, subangular blocky structure; very firm and brittle when moist; thin, discontinuous, grayish-brown (10YR 5/2) clay films on few peds; strongly acid; gradual, wavy boundary.

Bx2t—27 to 47 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/8) and light-gray (10YR 7/1) mottles; strong, very coarse, prismatic structure breaking into moderate, coarse, subangular blocky structure; very firm and brittle when moist; thin, discontinuous, grayish-brown (10YR 5/2) clay films on many peds; strongly acid; gradual, wavy boundary.

Bx3t—47 to 67 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/8) mottles and many light-gray (10YR 7/1) mottles; moderate, very coarse, prismatic structure breaking to moderate, coarse, subangular blocky structure; very firm and brittle when moist; thin, discontinuous clay films on few peds; common, medium, soft, black and brown, iron and manganese concretions; strongly acid; abrupt, wavy boundary.

C—67 to 75 inches, brownish-yellow (10YR 6/6) stratified silt loam and silty clay loam; common, fine, distinct, gray (10YR 6/1) mottles; massive; very friable when moist; strongly acid.

The solum ranges from 54 to 72 inches in thickness. Depth to the fragipan ranges from 22 to 30 inches. Depth to bedrock ranges from 72 inches to more than 10 feet. The Ap horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). This horizon is strongly acid to neutral, depending on the amount of lime applied.

Between the base of the A horizon and the top of the Bx horizon, the matrix color ranges from pale brown (10YR 6/3) to light gray (10YR 7/2) and the texture is silt loam or silty clay loam. The Bx horizon has matrix colors of brown (10YR 5/3) to yellowish brown (10YR 5/6) and is silt loam or silty clay loam.

Bartle soils occupy areas adjacent to moderately well drained Pekin soils. Their subsoil is grayer and has more mottling than that of the Pekin soils.

Bartle silt loam (Ba).—This nearly level soil occupies broad terraces. Included in mapping were a few small areas of deep, poorly drained soils and deep, moderately well drained soils that have a fragipan. Also included were a few small areas of gently sloping Bartle soils and of Bartle soils that have a weak fragipan. In addition, small areas of a deep, somewhat poorly drained soil that lacks a fragipan were included. This soil is on high bottom lands and is occasionally flooded.

This soil is well suited to corn and soybeans. Runoff is slow, and wetness is the main limitation. (Capability unit IIw-3; woodland suitability group 5)

Bedford Series

The Bedford series consists of deep, nearly level and gently sloping, moderately well drained soils that have a very slowly permeable fragipan. These soils are on broad ridges on uplands. Bedford soils formed in loess, and the underlying material weathered from cherty limestone.

In a representative profile, the surface layer is about 8 inches of dark-brown, neutral silt loam. The subsoil is more than 87 inches thick. The upper 8 inches is yellowish-brown, friable, very strongly acid silt loam that has pale-brown mottles. The middle 16 inches is dark yellowish-brown and yellowish-brown, very strongly acid, very firm and brittle, silty clay loam fragipan. It has mottles of brown and gray. The lower part is red, very strongly acid to medium acid, firm silty clay loam to clay.

Bedford soils have very slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow or medium.

Representative profile of Bedford silt loam in a cultivated field, 3,250 feet south and 1,250 feet east of the northwest corner of sec. 4, T. 1 S., R. 5 E. in Clark County:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable when moist; neutral; abrupt, smooth boundary.

B1—8 to 17 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; friable when moist; discontinuous clay films on few peds; strongly acid; gradual, wavy boundary.

B2t—17 to 25 inches, yellowish-brown (10YR 5/4) heavy silt loam; common, fine, faint, pale-brown (10YR 6/3) mottles; moderate, medium, subangular blocky structure; friable when moist; thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on few peds; many iron and manganese concretions; very strongly acid; gradual, smooth boundary.

Bx1t—25 to 30 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; many, fine, faint, brown (10YR 5/3) and yellowish-brown (10YR 5/4) mottles; moderate, coarse, prismatic structure breaking into moderate, coarse, subangular blocky structure; very firm and brittle when moist; gray (10YR 6/1) and pale-brown (10YR 6/3) silt coatings; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on most peds; many iron and manganese concretions; very strongly acid; abrupt, smooth boundary.

Bx2t—30 to 41 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, fine, distinct, pale-brown (10YR 6/3), gray (10YR 6/1), and light brownish-gray (10YR 6/2) mottles; strong, very coarse, prismatic structure (massive inside peds); very firm and brittle when moist; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on most peds; many iron and manganese concretions; very strongly acid; gradual, smooth boundary.

IIB31t—41 to 56 inches, red (2.5YR 4/6) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, very coarse, prismatic structure (massive inside peds); firm when moist; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on most peds; many iron and manganese concretions; very strongly acid; gradual, smooth boundary.

IIB32t—56 to 70 inches, red (2.5YR 4/6) clay; weak, very coarse, prismatic structure (massive inside peds); firm when moist; discontinuous, dark-gray (10YR 4/1) clay films thicker than 1 millimeter on most vertical peds; pinkish-gray (5YR 6/2) silt films on some peds; many iron and manganese concretions; very strongly acid in upper part and medium acid in lower part.

The solum ranges from 48 to 72 inches in thickness. Loess ranges from 30 to 48 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches. Depth to limestone bedrock ranges from 5 to 10 feet. The Ap horizon is dark brown (10YR 4/3) to yellowish brown (10YR 5/4). The Ap horizon is strongly acid to neutral, depending on the amount of lime applied.

Between the base of the A horizon and the top of the Bx horizon, the matrix colors are yellowish brown (10YR 5/4) to brown (7.5YR 5/4). The Bx horizon has matrix colors of dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/6) and is silt loam or silty clay loam. The B3 horizon is silty clay loam to clay in texture.

Bedford soils occupy areas adjacent to well-drained Crider soils, which formed in similar materials. These soils are less red in the upper part of the subsoil than Crider soils, and they have a fragipan, which Crider soils lack. Bedford soils in the lower part of the subsoil are cherty and more clayey than Zanesville soils, which have drainage similar to that of those soils.

Bedford silt loam, 0 to 2 percent slopes (BdA).—This soil occupies narrow ridges and knolls. It has the profile described as representative for the series. Included in mapping were a few small areas of deep, somewhat poorly drained Johnsburg soils and deep, well-drained Crider soils.

This soil is well suited to corn, soybeans, and small grain. Runoff is slow, and wetness is the main limitation. (Capability unit IIw-5; woodland suitability group 9)

Bedford silt loam, 2 to 6 percent slopes (BdB).—This soil occupies narrow ridges and short breaks between nearly level soils on ridges and sloping soils on hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is 4 to 8 inches thick. Included in mapping were Bedford soils that have a yellowish-brown surface layer less than 4 inches thick. Some areas of deep, well-drained Crider soils are also included.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe-7; woodland suitability group 9)

Berks Series

The Berks series consists of moderately deep, excessively drained soils on uplands. These steep and very steep soils occupy long hillsides. They formed in material weathered from sandstone, siltstone, and shale bedrock.

In a representative profile, the surface layer is about 1 inch of very dark gray, very strongly acid channery silt loam. The subsurface layer is about 3 inches of brown, very strongly acid channery silt loam. The subsoil is about 24 inches of yellowish-brown, very strongly acid, friable channery silt loam. The underlying material is acid sandstone, siltstone, and shale bedrock.

Berks soils have moderate permeability and very low available water capacity. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is very rapid.

Representative profile of Berks channery silt loam, in a wooded area where the slope is facing south, 1,400 feet east and 300 feet north of the southwest corner of sec. 23, T. 1 S., R. 6 E. in Clark County:

O1—2 inches to 1, fresh hardwood leaves and twigs.

O2—1 inch to 0, partly decomposed leaves, twigs, and roots.

A1—0 to 1 inch, very dark gray (10YR 3/1) channery silt loam; weak, fine, granular structure; friable when moist; many small roots; very strongly acid; abrupt, smooth boundary.

A2—1 to 4 inches, brown (10YR 5/3) channery silt loam; weak, fine, granular structure; friable when moist; many small roots; many sandstone and shale fragments ½ inch in diameter; very strongly acid; abrupt, smooth boundary.

B21—4 to 10 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, fine, subangular blocky structure; friable when moist; many small roots; 20 percent, by volume, of this horizon is coarse sandstone and shale fragments up to 6 inches in length; very strongly acid; friable when moist; abrupt, smooth boundary.

B22—10 to 15 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, fine, subangular blocky structure; friable when moist; many small roots; 50 percent, by volume, of this horizon is sandstone and shale fragments up to 6 inches in length; very strongly acid; abrupt, smooth boundary.

B3—15 to 28 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, fine, subangular blocky structure; very friable when moist; few small roots; more than 50 percent, by volume, of this horizon is sandstone and shale fragments up to 6 inches in size; very strongly acid; abrupt, smooth boundary.

R—28 inches, acid sandstone, siltstone, and shale bedrock.

The solum ranges from 18 to 30 inches in thickness. Depth to sandstone, siltstone, and shale bedrock ranges from 20 to 36 inches. The solum is strongly acid or very strongly acid. The quantity of sandstone and shale fragments ranges from 40 to 70 percent by volume. The A2 horizon ranges from dark brown (10YR 4/3) to pale brown (10YR 6/3).

The B horizon ranges from yellowish brown (10YR 5/4) to light yellowish brown (10YR 6/4). The C horizon, where present, ranges from yellowish brown (10YR 5/4) to light yellowish brown (10YR 6/4). The content of sandstone and shale fragments ranges from 50 to 90 percent in the C horizon.

Berks soils occupy areas adjacent to excessively drained Weikert soils and well-drained Gilpin soils. These soils have a thicker solum than Weikert soils, and the depth to bedrock is greater. They have a subsoil that is not so red or so clayey as that of the Gilpin soils. Berks soils have a less clayey subsoil and more acid underlying material than Rockcastle soils. Berks soils have drainage similar to that of Rockcastle soils.

Berks channery silt loam, 18 to 35 percent slopes (BeF).—This soil occupies hillsides. Included in mapping were some areas of Weikert channery silt loam, which make up about 15 percent of the acreage. The Weikert soil is on the steeper slopes and on very narrow ridges. Also included were small areas of moderately deep, well-drained Gilpin soils on the upper parts of the slopes ad-

jacent to ridges. Some of these have slopes of 12 to 18 percent and a surface layer less than 8 inches thick. In some places there is rock outcrop. The more prominent areas are shown on the map by spot symbols.

This soil is suited to trees. Erosion, runoff, and slope are hazards in use and management. (Capability unit VIIe–2; woodland suitability group 12)

Bonnie Series

The Bonnie series consists of deep, poorly drained soils on bottom lands. These soils are along some of the larger streams in the survey area. They are in low, broad, nearly level or slightly depressional areas adjacent to higher lying soils on terraces or uplands. They formed in silty alluvial material.

In a representative profile, the surface layer is about 5 inches of dark grayish-brown, slightly acid silt loam that has brown mottles. The subsoil is about 45 inches thick. The upper 17 inches is light brownish-gray, medium acid, friable silt loam that has yellowish-brown mottles. The lower 28 inches is light-gray, strongly acid, friable to firm silt loam and silty clay loam that have yellowish-brown mottles. The underlying material is gray, strongly acid, firm silt loam that has yellowish-brown mottles.

Bonnie soils have slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The surface layer is dominantly strongly acid in areas not limed. Surface runoff is very slow.

Representative profile of Bonnie silt loam in a wooded area, 1,500 feet northeast of the southwest corner and 500 feet northwest of the south boundary of Clark Grant 204 in Clark County:

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, distinct mottles of light brownish gray (10YR 6/2), brown (10YR 5/3), and yellowish brown (10YR 5/6); moderate, fine, granular structure; friable when moist; slightly acid; abrupt, smooth boundary.

B21—5 to 22 inches, light brownish-gray (10YR 6/2) silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium and coarse, subangular blocky structure; friable when moist; medium acid; clear, smooth boundary.

B22—22 to 40 inches, light-gray (2.5Y 7/2) heavy silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure; friable when moist; thin, gray (10YR 6/1) silt films on few void walls, on a few peds, and in root channels; strongly acid; gradual, irregular boundary.

B23—40 to 50 inches, light-gray (2.5Y 7/2) light silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure; firm when moist; many thick silt films on void walls, on peds, and in root channels; strongly acid; gradual, irregular boundary.

C—50 to 60 inches, gray (10YR 6/1) silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); massive; firm when moist; strongly acid.

The solum ranges from 42 to 60 inches in thickness. Depth to bedrock ranges from 60 inches to more than 10 feet. Reaction below the A horizon is dominantly strongly acid or very strongly acid. The A1 horizon ranges from light gray (10YR 7/1) to dark grayish brown (10YR 4/2). The B2 horizon has matrix colors of gray (10YR 6/1) to light gray (2.5YR 7/2). The C horizon has stratified layers that range from fine sand to silty clay loam in texture.

Bonnie soils occupy areas adjacent to the somewhat poorly drained Bartle soils. They have a grayer subsoil, have more mottling, and lack the fragipan of Bartle soils. They lack the fragipan of Clermont soils but have drainage similar to that of those soils.

Bonnie silt loam (Bo).—This nearly level soil occupies broad bottoms and low terraces back from the main streams and is adjacent to uplands or terraces. Included in mapping were a few small areas of deep, somewhat poorly drained Bartle and Wakeland soils. Also included were a few small areas of deep, dark-colored soils in depressions.

This soil is moderately well suited to corn and soybeans if drainage is adequate. Runoff is very slow, and wetness is the main limitation. This soil is in low areas where much seepage occurs and where flooding occurs in winter and spring. Artificial drainage is hard to establish because of the poor natural drainage, low position, and difficulty in obtaining outlets. (Capability unit IIIw–10; woodland suitability group 11)

Cincinnati Series

The Cincinnati series consists of deep, gently sloping to strongly sloping, well-drained soils that have a slowly permeable fragipan. These soils occupy ridges and hillsides. They formed in thin loess and the underlying loam or clay loam glacial till. Below the till is limestone or shale bedrock.

In a representative profile, the surface layer is about 7 inches of dark-brown, neutral silt loam. The subsoil is about 69 inches thick. The upper 15 inches is strong-brown, slightly acid to very strongly acid, friable silty clay loam that has yellowish-brown mottles. The middle 23 inches is a fragipan of yellowish-brown, strongly acid to very strongly acid, very firm and brittle silt loam and silty clay loam mottled with light brownish gray. The lower part is strong-brown, strongly acid, firm silty clay loam and clay loam that has reddish-yellow and pale-brown mottles.

Cincinnati soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. The organic-matter content and natural fertility are low. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow to rapid.

Representative profile of Cincinnati silt loam, in a wooded area where the slope is 9 percent and faces southeast, 1,150 feet southeast of the northwest corner and 45 feet east of the west boundary of Clark Grant 262 in Clark County:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable when moist; many small roots; neutral; abrupt, smooth boundary.

B1t—7 to 18 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, fine and medium, subangular blocky structure; friable when moist; few small roots; thin, dark-brown (7.5YR 4/4), discontinuous clay films and yellowish-brown (10YR 5/4) silt films on few peds; slightly acid; clear, wavy boundary.

B2t—18 to 22 inches, strong-brown (7.5YR 5/6) silty clay loam; common, fine, distinct, light yellowish-brown (10YR 6/4) mottles; moderate, medium, subangular blocky structure; friable when moist; few large roots; thin, dark brown (7.5YR 4/4), discontinuous clay films on few peds; few till pebbles; few manganese concretions; very strongly acid; clear, wavy boundary.

IIBx1t—22 to 28 inches, yellowish-brown (10YR 5/6) heavy silt loam; common, fine, faint mottles of light brownish gray (10YR 6/2); moderate, coarse, prismatic structure breaking to moderate, coarse, subangular and angular blocky structure; very firm and brittle when moist; thin, strong-brown (7.5YR 5/6), discontinuous clay films and pale-brown (10YR 6/3) silt films on most peds; many till pebbles; few manganese concretions; very strongly acid; clear, wavy boundary.

IIBx2t—28 to 45 inches, yellowish-brown (10YR 5/6) light silty clay loam; common, fine, faint mottles of light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2); strong, very coarse, prismatic structure (massive inside peds); very firm and brittle when moist; thin, strong-brown (7.5YR 5/6), discontinuous clay films on most peds; many till pebbles; few manganese concretions; strongly acid; clear, wavy boundary.

IIB31t—45 to 55 inches, strong-brown (7.5YR 5/6) silty clay loam; many, fine, reddish-yellow (7.5YR 6/8) mottles and few, fine, pale-brown (10YR 6/3) mottles; massive; firm when moist; thin, strong-brown (7.5YR 5/6), discontinuous clay films in pores and on some peds; few manganese concretions; strongly acid; clear, wavy boundary.

IIB32—55 to 76 inches, strong-brown (7.5YR 5/6) clay loam; many, fine, reddish-yellow (7.5YR 6/8) mottles and few, fine, pale-brown (10YR 6/3) and very pale brown (10YR 7/4) mottles; massive; firm when moist; few manganese concretions; strongly acid.

The solum ranges from 65 to 84 inches in thickness. Loess ranges from 20 to 40 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches. Depth to limestone or shale bedrock ranges from 72 inches to more than 10 feet. The Ap horizon is dark brown (10YR 4/3) to brown (10YR 5/3). It is strongly acid to neutral depending on the amount of lime applied.

The layer between the base of the A horizon and the top of the Bx horizon has matrix colors of brown (7.5YR 5/4) to yellowish brown (10YR 5/6) and is silt loam or silty clay loam. The Bx horizon has matrix colors of strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6). Consistence is firm or very firm. The C horizon, where present, is gritty silt loam to clay loam material weathered from till. Reaction ranges from slightly acid to strongly acid in the C horizon.

Cincinnati soils occupy slopes adjacent to the less red, moderately well drained Rossmoyne soils. These soils have drainage similar to that of Grayford, Jennings, and Trappist soils, but they have a thicker solum, contain a fragipan, and are yellower and less clayey in the subsoil than Grayford and Trappist soils. They have a thicker solum than Jennings soils, and depth to bedrock is greater.

Cincinnati silt loam, 2 to 6 percent slopes, eroded (CcB2).—This soil occupies narrow ridges and short breaks between nearly level soils on ridges and sloping soils on hillsides. Included in mapping were a few small areas where the surface layer is less than 3 inches thick or is 8 to 12 inches thick. Also included were small areas of deep, moderately well drained Rossmoyne soils and deep, well-drained Jennings soils.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe-7; woodland suitability group 9)

Cincinnati silt loam, 6 to 12 percent slopes, eroded (CcC2).—This soil occupies ridges and hillsides. It has the profile described as representative for the series. Included in mapping were small areas of Cincinnati soils that have a surface layer 8 to 12 inches thick. Most of these areas are in small, wooded areas and have a dark grayish-brown surface layer. Also included were areas of severely eroded Cincinnati soils. Small areas of deep, well-drained Grayford and Jennings soils and moderately deep, well-drained Trappist soils were also included.

This soil is moderately well suited to corn, soybeans, and small grain. The main hazards are erosion and runoff. (Capability unit IIIe-7; woodland suitability group 9)

Cincinnati silt loam, 6 to 12 percent slopes, severely eroded (CcC3).—This soil occupies ridges and hillsides. A few rills and small gullies are common. The profile of this soil is similar to that described as representative for the series, except that the surface layer is brown to yellowish brown and is less than 3 inches thick. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were a few small areas of Cincinnati soils that have a surface layer 3 to 8 inches thick. Also included were small areas of deep, well-drained Grayford and Jennings soils and moderately deep, well-drained Trappist soils.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe-7; woodland suitability group 9)

Cincinnati silt loam, 12 to 18 percent slopes, eroded (CcD2).—This soil is on hillside slopes that are smooth and nearly uniformly shaped. A few rills are common. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and the subsoil is about 65 inches and the depth to the fragipan is about 20 inches. Included in mapping were small areas of severely eroded Cincinnati soils and Cincinnati soils that are steeper than 18 percent. Also included were small areas of deep, well-drained Grayford and Hickory soils and moderately deep, well-drained Trappist soils.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards in use and management. (Capability unit IVe-7; woodland suitability group 9)

Cincinnati silt loam, 12 to 18 percent slopes, severely eroded (CcD3).—This soil occupies hillside slopes that are smooth and nearly uniformly shaped. There are numerous rills and small gullies. The profile of this soil is similar to that described as representative for the series, except that the surface layer is brown to yellowish brown and is less than 3 inches thick. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. The silt mantle and subsoil are thinner than in the profile described as representative for the series. Included in mapping were a few small areas of Cincinnati soils that have a surface layer 3 to 8 inches thick and Cincinnati soils that are steeper than 18 percent. Also included were small areas of deep, well-drained Grayford and Hickory soils and moderately deep, well-drained Trappist soils.

This soil is suited to permanent pasture and trees. Erosion and runoff are hazards in use and management. (Capability unit VIe-1; woodland suitability group 9)

Clermont Series

The Clermont series consists of deep, nearly level, poorly drained soils that have a very slowly permeable fragipan. These soils occupy broad ridges. They formed

in loess and the underlying loam or clay loam glacial till. Below the till is limestone or black shale.

In a representative profile, the surface layer is 8 inches of grayish-brown, neutral silt loam mottled with yellowish brown. The subsurface layer is 13 inches of gray, very strongly acid silt loam mottled with dark yellowish brown. The subsoil is more than 53 inches thick. The upper 11 inches is gray, very strongly acid, friable silt loam mottled with yellowish brown. The middle 34 inches is a fragipan of gray and yellowish-brown, strongly acid, very firm and brittle silt loam mottled with light yellowish brown and gray. The lower part is yellowish-brown, medium acid, friable silt loam mottled with gray. Between depths of 50 and 74 inches there is enough sand to give a gritty feel.

Clermont soils have very slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The surface layer is dominantly strongly acid in areas not limed. Surface runoff is very slow.

Representative profile of a Clermont silt loam in a cultivated field, 3,000 feet north of the southwest corner and 2,125 feet northeast of the west boundary of Clark Grant 263 in Clark County:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; many, fine, faint, dark yellowish-brown (10YR 3/4) mottles; moderate, medium, granular structure; friable when moist; many small roots; neutral; abrupt, smooth boundary.

A2—8 to 21 inches, gray (10YR 6/1) silt loam; common, medium, faint, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, granular structure; friable when moist; many small roots; vesicular; common iron and manganese concretions; very strongly acid; clear, wavy boundary.

B1—21 to 32 inches, gray (10YR 6/1) silt loam; many, distinct, coarse, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable when moist; few small roots; vesicular; common iron and manganese concretions; very strongly acid; clear, irregular boundary.

Bx1t—32 to 50 inches, gray (10YR 6/1) silt loam; many, medium, distinct, light yellowish-brown (10YR 6/4) and brownish-yellow (10YR 6/6) mottles; moderate, coarse, prismatic structure, very firm and brittle when moist; few fine roots; vesicular; thin, discontinuous, gray (10YR 6/1) clay films on peds; few iron and manganese concretions, strongly acid; gradual, wavy boundary.

IIBx2t—50 to 66 inches, yellowish-brown (10YR 5/8) silt loam; many, coarse, distinct, gray (10YR 6/1) mottles; moderate, very coarse, prismatic structure; very firm and brittle when moist; thin, discontinuous, gray (10YR 6/1) clay films on few peds; few pebbles; many iron and manganese concretions; strongly acid; gradual, wavy boundary.

IIB3—66 to 74 inches, yellowish-brown (10YR 5/6) silt loam; many, coarse, distinct, gray (10YR 5/1) mottles; massive; friable when moist; many iron and manganese concretions; medium acid.

The solum is more than 72 inches thick. Loess ranges from 35 to 48 inches in thickness. Depth to the fragipan ranges from 22 to 35 inches. Depth to limestone or shale bedrock ranges from 72 inches to more than 10 feet. The Ap horizon is grayish brown (10YR 5/2) to gray (10YR 6/1). The A horizon is strongly acid to neutral, depending on the amount of lime applied. Reaction is medium acid to very strongly acid in areas not limed. The Bx horizon has matrix colors of gray (10YR 5/1) to brownish yellow (10YR 6/8) and is silt loam or silty clay loam. Structure of the Bx horizon is moderate or strong, coarse or very coarse, prismatic. Consistence is firm or very firm, and it is strongly acid or very strongly acid. The B3 horizon is gritty silt loam to clay loam material weathered from till. The IIBx and B3 horizons contain enough sand to have a gritty feel. They are slightly acid to strongly acid.

Clermont soils occupy areas adjacent to somewhat poorly drained Avonburg soils and formed in similar materials. They have grayer A2 and B1 horizons than Avonburg soils.

Clermont silt loam (Ce).—This nearly level soil occupies broad ridges. Included in mapping were a few small areas of deep, somewhat poorly drained Avonburg soils. Also included were a few small areas of dark, very poorly drained soils in depressions. Where there are inclusions of poorly drained soils associated with Bartle soils, the subsoil has stratified layers of silt loam and silty clay loam and no till.

This soil is moderately well suited to corn and soybeans (fig. 3). Runoff is very slow, and wetness is the main limitation. (Capability unit IIIw-12; woodland suitability group 11)

Colyer Series

The Colyer series consists of shallow, excessively drained soils on uplands. These steep and very steep soils are on hillsides. They formed in material weathered from black shale bedrock.

In a representative profile, the surface layer is about 5 inches of dark-brown, neutral shaly silt loam. The subsoil is about 11 inches of reddish-brown, very strongly acid, friable, shaly, heavy silty clay loam. The underlying material is black shale bedrock.

Colyer soils have moderate permeability and very low available water capacity. These soils are low in organic-matter content and natural fertility. The surface layer is dominantly strongly acid in areas not limed. Surface runoff is very rapid.

Representative profile of Colyer shaly silt loam in a wooded area where the slope faces west, 1,125 feet northeast of the northwest corner and 250 feet southeast of the north boundary of Clark Grant 241 in Clark County:

O1—2 inches to 1 inch, fresh hardwood leaves and twigs.

O2—1 inch to 0, partly decomposed leaves, twigs, and roots.

A1—0 to 5 inches, dark-brown (10YR 4/3) shaly silt loam; moderate, fine, granular structure; friable when moist; many small and medium roots; neutral; clear, smooth boundary.

B2—5 to 16 inches, reddish-brown (5YR 4/4), shaly, heavy silty clay loam; moderate, medium, subangular blocky structure; friable when moist; few large roots; few, small, black shale fragments; very strongly acid; gradual, wavy boundary.

R—16 inches, black shale bedrock; upper part can be scratched with fingernail.

The solum ranges from 5 to 19 inches in thickness. Depth to black shale bedrock ranges from 8 to 20 inches. The solum is strongly acid or very strongly acid. The quantity of soft shale fragments in the solum ranges from 20 to 70 percent, by volume. The A1 horizon ranges from dark brown (10YR 4/3) to reddish brown (5YR 4/3) silt loam or shaly silt loam. The B horizon ranges from reddish brown (5 YR 4/4) to yellowish brown (10YR 5/4) shaly silty clay loam or shaly silty clay. Where a C horizon is present, it ranges from reddish brown (5YR 5/4) to yellowish brown (10YR 5/4).

Colyer soils are in areas adjacent to well-drained Trappist soils and formed in similar materials. These soils have a thinner solum and are shallower to bedrock than Trappist soils. Colyer soils typically have a redder subsoil than Berks, Rockcastle, and Weikert soils but have drainage similar to that of those soils. They have a browner, more acid, and less clayey subsoil than Corydon and Fairmount soils, which have similar drainage.

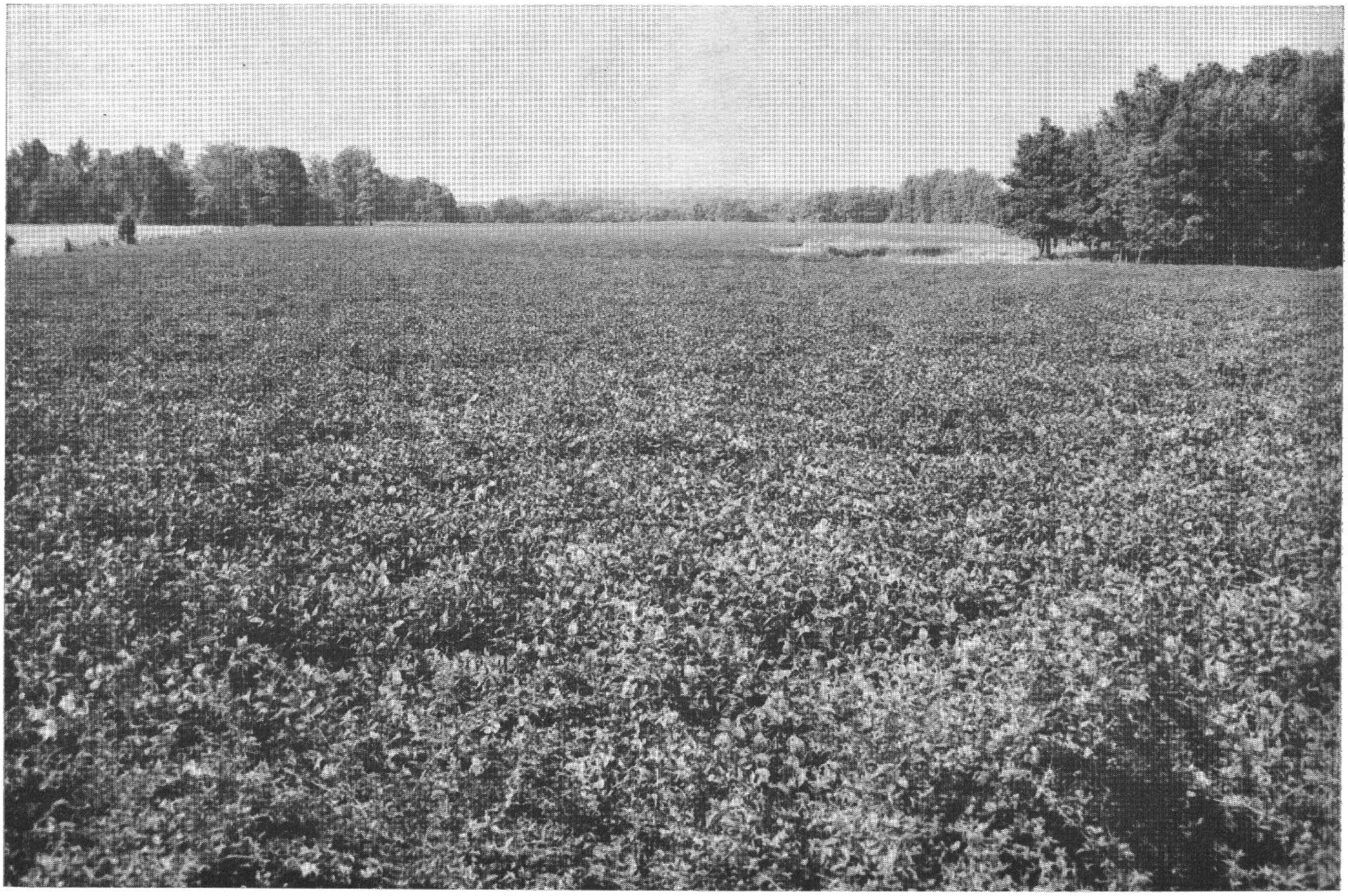

Figure 3.—Field of soybeans on Clermont silt loam.

Colyer shaly silt loam, 18 to 35 percent slopes (ChF).—This soil occupies hillsides. In some places there are outcrops of black shale bedrock. Included in mapping were small areas of reddish-brown, shallow, severely eroded soils that have a surface layer of silty clay loam. Less than 3 inches of the present surface layer is material from the original surface layer. Most of the included areas have been cleared for pasture. Also included were small areas of Colyer soils where the slope is less than 18 percent or more than 35 percent. In addition, small areas of steep, moderately deep, well-drained Trappist soils on narrow ridges and hillsides were included.

This soil is suited to trees. Erosion and runoff are hazards in use and management. (Capability unit VIIe-2; woodland suitability group 22)

Corydon Series

The Corydon series consists of shallow, excessively drained soils on uplands. These strongly sloping to extremely steep soils are on hillsides. They formed in material weathered from limestone bedrock.

In a representative profile, the surface layer is about 8 inches thick and is neutral. The upper 4 inches is very dark grayish-brown stony silt loam. The lower part is dark-brown, firm silty clay loam. The subsoil is about 10 inches of dark-brown, mainly neutral, firm silty clay. The underlying material is limestone bedrock.

Corydon soils have moderately slow permeability and very low available water capacity. They are high in organic-matter content and moderate in natural fertility. The plow layer is dominantly neutral in areas not limed. Surface runoff is very rapid.

Representative profile of a Corydon stony silt loam, 25 to 70 percent slopes, in a wooded area where the slope is 65 percent and faces north, 1,700 feet south and 100 feet west of the northeast corner of the NE$\frac{1}{4}$ of sec. 35, T. 3 S., R. 5 E. in Floyd County:

O1—1 inch to 0, loose hardwood leaves and twigs.

A11—0 to 4 inches, very dark grayish-brown (10YR 3/2) stony silt loam (dark brown (10YR 3/3) when rubbed); moderate, medium, granular structure; friable when moist; many small roots; neutral; clear, smooth boundary.

A12—4 to 8 inches, dark-brown (10YR 3/3) silty clay loam (dark yellowish brown (10YR 3/4) when rubbed); moderate, medium, granular structure; firm when moist; many small roots; neutral; clear, smooth boundary.

B2t—8 to 18 inches, dark-brown (10YR 4/3) silty clay; moderate and strong, medium, angular and subangular blocky structure; firm when moist; few small roots; thin, discontinuous, dark yellowish-brown (10YR 3/4) clay films on few peds and void linings; mainly neutral, but calcareous about ½ inch above limestone bedrock; abrupt, irregular boundary.

R—18 inches, limestone bedrock.

The solum ranges from 5 to 19 inches in thickness. Depth to limestone bedrock ranges from 10 to 20 inches. The solum ranges from neutral to moderately alkaline. The A horizon ranges from black (10YR 2/1) to very dark grayish-brown (10YR 3/2) silt loam or silty clay loam. The diameter of stones on the surface ranges from 10 to 20 inches, and these stones are from 20 feet to more than 40 feet apart. The B horizon ranges from dark-brown (10YR 4/3) to reddish-brown (5YR 4/4) silty clay or clay. Consistence is firm or very firm.

Corydon soils occupy slopes adjacent to the well-drained Crider soils, which have a thicker solum and a greater depth to bedrock. Corydon soils formed in material weathered from limestone bedrock, but Fairmount soils formed in material weathered from interbedded limestone and calcareous clay shale. They are darker colored, less acid, and more clayey throughout the profile than Berks and Weikert soils but have drainage similar to those soils.

Corydon stony silt loam, 12 to 25 percent slopes (CoE).—This soil occupies hillsides. In some places there are outcrops of limestone bedrock and stones. Stones are more than 10 inches in diameter and are more than 40 feet apart. The profile of this soil is similar to that described as representative for the series, except that the surface layer is 3 to 6 inches thick. Included in mapping were small areas of dark-brown, severely eroded, shallow soils that have a silty clay loam or silty clay surface layer that is less than 3 inches thick. Most areas of these soils are in woods that have been cleared for pasture. Also included were small areas of deep, well-drained Hagerstown and Crider soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are hazards in use and management. (Capability unit VIe–2; woodland suitability group 7)

Corydon stony silt loam, 25 to 70 percent slopes (CoG).—This soil occupies hillsides. In some areas there are outcrops of limestone bedrock and stones. Stones are more than 10 inches in diameter and 20 to 40 feet apart. This soil has the profile described as representative for the series. Included in mapping were small areas of severely eroded, shallow soils that have a silty clay loam or silty clay surface layer less than 3 inches thick. Most areas of these soils are in woods that have been cleared for pasture. Also included were small areas of Corydon soils where the slope is less than 25 percent.

This soil is suited to trees. Erosion and runoff are hazards in use and management. (Capability unit VIIe–1; woodland suitability group 7)

Crider Series

The Crider series consists of deep, well-drained soils on uplands. These soils are nearly level and gently sloping on ridges and sloping to strongly sloping on hillsides. They formed in loess, and the underlying material weathered from limestone.

In a representative profile, the surface layer is about 9 inches of dark-brown, neutral silt loam. The subsoil is about 56 inches thick. The upper 21 inches is strong-brown to red, medium acid, firm silty clay loam. The lower part is red to dark reddish-brown, strongly acid to medium acid, very firm clay. Below this is limestone bedrock.

Crider soils have moderately slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow to rapid. There are sinkholes in some places.

Representative profile of Crider silt loam, 2 to 6 percent slopes, eroded, in a cultivated field where the slope is 4 percent and faces northeast, 2,100 feet northeast of the southwest corner and 12 feet northwest of the south boundary of Clark Grant in Clark County:

Ap—0 to 9 inches, dark-brown (7.5YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; many small roots; neutral; abrupt, smooth boundary.

B1—9 to 15 inches, strong-brown (7.5YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable when moist; many small roots; slightly acid; clear, smooth boundary.

B21—15 to 30 inches, yellowish-red (5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm when moist; few small roots; medium acid; clear, smooth boundary.

B22—30 to 36 inches, red (2.5YR 4/6) light silty clay loam; moderate, medium, subangular blocky structure; firm when moist; many soft manganese concretions; medium acid; clear, smooth boundary.

IIB23t—36 to 42 inches, red (10R 4/6) clay; moderate, fine, angular blocky structure; very firm when moist; thin, discontinuous, dark reddish-brown (5YR 3/3) clay films on many peds; few small chert fragments; few soft manganese concretions; strongly acid; clear, smooth boundary.

IIB24t—42 to 56 inches, dark reddish-brown (2.5YR 3/4) clay; strong, medium, angular blocky structure; very firm when moist; thin, discontinuous, dark reddish-brown (5YR 3/3) clay films on many peds; few fine chert fragments; strongly acid; clear, smooth boundary.

IIB25t—56 to 65 inches, dark reddish-brown (2.5YR 3/4) clay; strong, medium, angular blocky structure; very firm when moist; thin, discontinuous, dark reddish-brown (5YR 3/3) clay films on many peds; many chert fragments; medium acid, except for neutral reaction near bedrock; abrupt, wavy boundary.

R—65 inches, limestone bedrock.

The solum ranges from 42 to 72 inches in thickness. Loess ranges from 18 to 48 inches in thickness. Depth to limestone bedrock ranges from 50 to 72 inches. The Ap horizon ranges from dark grayish brown (10YR 4/2) to dark brown (7.5YR 4/2). It is strongly acid to neutral, depending on the amount of lime applied. The B2 horizon has matrix colors of red (10R 4/6) to strong brown (7.5YR 5/6). It ranges from silty clay loam to clay and is dominantly medium acid to very strongly acid.

Crider soils occupy slopes adjacent to the well-drained Grayford soils, which have till in the subsoil. Crider soils have a redder and more clayey subsoil than Grayford soils. They have a thicker solum and are deeper to bedrock than the associated Corydon soils, which also formed over limestone bedrock.

Crider silt loam, 0 to 2 percent slopes (CrA).—This soil occupies narrow ridges. The profile of this soil is similar to that described as representative for the series, except that the surface layer is 9 to 12 inches thick and the combined thickness of the surface layer and subsoil is about 70 inches. Included in mapping were a few small areas of deep, well-drained Grayford soils. Also included were a few small areas of deep, moderately well drained soils that have a fragipan and overlie black shale.

This soil is well suited to corn, soybeans, and small grain. It has few if any limitations. (Capability unit I–1; woodland suitability group 1)

Crider silt loam, 2 to 6 percent slopes, eroded (CrB2).—This soil occupies narrow ridges and short breaks between nearly level ridges and sloping hillsides. The profile of this soil is the one described as representative for the series.

Included in mapping were a few small areas of deep, moderately well drained Grayford and Hagerstown soils and small areas of deep, moderately well drained soils that have a fragipan and overlie black shale. Also included, at the high elevations in the western part of the survey area, were areas of a deep, well-drained soil that formed in loess and has underlying material weathered from stratified cherty limestone, sandstone, and shale. Chert content in the subsoil of this soil ranges from 5 to 20 percent. Areas of this soil differ from each other in color, texture, and consistence of the subsoil according to the relative proportion of the materials in which they formed. In some places there is a weak fragipan about 6 inches thick at a depth of about 2 feet. Areas of this inclusion are slightly less productive than the Crider soil in this unit for most farm crops and trees. In some places there are depressions and sinkholes. The more prominent ones are shown on the map by spot symbols.

The soil in this unit is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–3; woodland suitability group 1)

Crider silt loam, 2 to 6 percent slopes, severely eroded (CrB3).—This soil occupies narrow ridges and short breaks between nearly level ridges and sloping hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is strong brown and is less than 3 inches thick. Also, the surface layer is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer.

Included in mapping were small areas of deep, well-drained Grayford and Hagerstown soils and a few small areas of a deep, moderately well drained soil that has a fragipan and overlies black shale. Also included, at the high elevations in the western part of the survey area, were areas of a deep, well-drained soil that formed in loess and is underlain by material weathered from stratified cherty limestone, sandstone, and shale. Chert content in the subsoil of this soil ranges from 5 to 20 percent. Areas of this soil differ from each other in color, texture, and consistence of the subsoil according to the relative proportion of the materials in which they formed. In some places there is a weak fragipan about 6 inches thick at a depth of about 2 feet. Areas of this inclusion are slightly less productive than the Crider soil in this unit for most farm crops and trees. In some places there are depressions and sinkholes. The more prominent ones are shown on the map by spot symbols.

The soil in this unit is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe–3; woodland suitability group 1)

Crider silt loam, 6 to 12 percent slopes, eroded (CrC2).—This sloping soil occupies ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the loess mantle is about 30 inches thick and the combined thickness of the surface layer and subsoil is about 60 inches.

Included in mapping were small areas of deep, well-drained Grayford and Hagerstown soils and a few small areas of a deep, moderately well drained soil that has a fragipan and overlies black shale. Also included, at the high elevations in the western part of the survey area, were areas of a deep, well-drained soil that formed in loess and is underlain by material weathered from stratified cherty limestone, sandstone, and shale. Chert content in the subsoil ranges from 5 to 20 percent. Areas of this soil differ from each other in color, texture, and consistence of the subsoil according to the relative proportion of the materials in which they formed. In some places there is a weak fragipan about 6 inches thick at a depth of about 2 feet. Areas of this inclusion are slightly less productive than the Crider soil in this unit for most farm crops and trees. In some places there are depressions and sinkholes. The more prominent ones are shown on the map by spot symbols.

The soil in this unit is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe–3; woodland suitability group 1)

Crider silt loam, 6 to 12 percent slopes, severely eroded (CrC3).—This sloping soil occupies ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is strong brown and is less than 3 inches thick. It is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. The loess mantle is about 27 inches thick, and the combined thickness of the surface layer and subsoil is about 55 inches.

Included in mapping were small areas of deep, well-drained Grayford and Hagerstown soils and a few small areas of a deep, moderately well drained soil that has a fragipan and overlies black shale. Also included, at the high elevations in the western part of the survey area, were areas of a deep, well-drained soil that formed in loess and is underlain by material weathered from stratified cherty limestone, sandstone, and shale. Chert content in the subsoil of this soil ranges from 5 to 20 percent. Areas of this soil differ from each other in color, texture, and consistence of the subsoil according to the relative proportion of the materials in which they formed. In some places there is a weak fragipan about 6 inches thick at a depth of about 2 feet. Areas of this inclusion are slightly less productive than the Crider soil in this unit for most crops and trees. In some places there are depressions and sinkholes. The more prominent ones are shown on the map by spot symbols.

The soil in this unit is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–3; woodland suitability group 1)

Crider silt loam, 12 to 18 percent slopes, eroded (CrD2).—This strongly sloping soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 50 inches.

Included in mapping were small areas of deep, well-drained Grayford and Hagerstown soils and some areas of a well-drained soil that is less than 40 inches to limestone bedrock. Also included, at higher elevations in the western part of the survey area, were areas of a well-drained soil that formed in loess and is underlain by material weathered from stratified cherty limestone, sandstone, and shale. Chert content in the subsoil of this soil ranges from 5 to 20 percent. Areas of this soil differ from each other in color, texture, and consistence of the subsoil

according to the relative proportion of the materials in which they formed. In some places there is a weak fragipan about 6 inches thick at a depth of about 2 feet. Areas of this inclusion are slightly less productive than the Crider soil in this unit for most farm crops and trees. In some places there are depressions, sinkholes, and rock outcrops. The more prominent areas are shown on the map by spot symbols.

The soil in this unit is poorly suited to corn, soybeans, and small grain. This soil is excellent for alfalfa. Erosion and runoff are the main hazards in use and management. (Capability unit IVe-3; woodland suitability group 1)

Crider silt loam, 12 to 18 percent slopes, severely eroded (CrD3).—This strongly sloping soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 45 inches. Also, the surface layer is strong brown, and less than 3 inches of the original surface layer remains. It is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer.

Included in mapping were small areas of deep, well-drained Grayford and Hagerstown soils and some areas of a well-drained soil that is less than 50 inches deep to limestone bedrock. Also included, at the high elevations in the western part of the survey area, were areas of a deep, well-drained soil that formed in loess and is underlain by material weathered from stratified cherty limestone, sandstone, and shale. Chert content in the subsoil of this soil ranges from 5 to 20 percent. Areas of this soil differ from each other in color, texture, and consistence of the subsoil according to the relative proportion of the materials in which they formed. In some places there is a weak fragipan about 6 inches thick at a depth of about 2 feet. Areas of this inclusion are slightly less productive than the Crider soil in this unit for most farm crops and trees. In some places there are depressions, sinkholes, and rock outcrops. The more prominent areas are shown on the map by spot symbols.

The soil in this unit is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 1)

Fairmount Series

The Fairmount series consists of shallow, excessively drained soils on uplands. These strongly sloping to extremely steep soils occupy hillsides. Fairmount soils formed in material weathered from interbedded limestone and calcareous clay shales.

In a representative profile, the surface layer is about 11 inches thick and is neutral. The upper 7 inches is dark-brown silty clay loam. The lower part is dark yellowish-brown silty clay that has yellowish-brown mottles. The subsoil is about 8 inches of yellowish-brown, moderately alkaline, firm clay. Below this is soft, calcareous shale and limestone bedrock.

Fairmount soils have moderately slow permeability and low available water capacity. They are high in organic-matter content and natural fertility. The plow layer is dominantly neutral in areas not limed. Surface runoff is very rapid. Fairmount soils are well suited to pasture.

Representative profile of Fairmount stony silty clay loam, 25 to 70 percent slopes, in a wooded area where the slope is 50 percent and faces east, 625 feet south and 500 feet east of the northwest corner of sec. 13, T. 1 N., R. 9 E. in Clark County:

O1—2 inches to 1 inch, fresh hardwood leaves and twigs.

O2—1 inch to 0, partly decomposed leaves and twigs.

A11—0 to 7 inches, dark-brown (10YR 3/3) stony silty clay loam (10YR 3/3 when rubbed); moderate, medium, granular structure; friable when moist; many small roots; neutral; clear, smooth boundary.

A12—7 to 11 inches, dark yellowish-brown (10YR 3/4) stony silty clay; few, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable when moist; few small roots; neutral; clear, smooth boundary.

B2—11 to 19 inches, yellowish-brown (10YR 5/4) clay; massive; firm when moist; few small and medium roots; thin, discontinuous, dark-brown (10YR 4/3) clay films on many peds and in pores; few small limestone fragments in lower part; moderately alkaline; gradual, irregular boundary.

R—19 inches, soft calcareous shale and limestone bedrock.

The solum ranges from 5 to 20 inches in thickness. Depth to calcareous clay shale and limestone bedrock ranges from 10 to 20 inches. The solum is neutral to moderately alkaline. The content of limestone fragments in the solum ranges from 10 to 50 percent by volume. The A1 horizon ranges from black (10YR 2/1) to dark brown (10YR 3/3). The diameter of stones on the surface ranges from 10 to 20 inches, and these stones are from 20 feet to more than 40 feet apart. The B horizon ranges from yellowish-brown (10YR 5/6) to dark grayish-brown (2.5Y 4/2) silty clay or clay. Consistence is firm or very firm. The C horizon, where present, ranges from light yellowish-brown (10YR 6/4) to light olive-brown (2.5Y 5/4) silty clay or clay. Consistence is firm or very firm.

Fairmount soils occupy areas below adjacent well-drained Crider and Hagerstown soils and areas adjacent to excessively drained Corydon soils. Fairmount soils have a yellower subsoil, a thinner solum, and are shallower to bedrock than Crider and Hagerstown soils. Fairmount soils formed in material weathered from interbedded limestone and calcareous clay shale, but Corydon soils formed in material weathered from limestone bedrock.

Fairmount silty clay loam, 12 to 25 percent slopes (FaE).—This soil occupies hillsides. In some places there are outcrops of limestone bedrock and stones. The stones are more than 10 inches in diameter and more than 40 feet apart. The profile of this soil is similar to that described as representative for the series, except that the surface layer is less than 3 to 6 inches thick.

Included in mapping were small areas of yellowish-brown, severely eroded, shallow soils that have a silty clay loam or silty clay surface layer less than 3 inches thick. Most areas of these soils are in areas where woods have been cleared for pasture. In some places are small areas of dark-brown, moderately deep or deep, well-drained soils near the base of hillside slopes. Also included were small areas of deep, well-drained soils formed in loess and material weathered from interbedded limestone and calcareous shale.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe-2; woodland suitability group 7)

Fairmount stony silty clay loam, 25 to 70 percent slopes (FcG).—This soil occupies hillsides. In some places there are outcrops of limestone bedrock and stones. The stones are more than 10 inches in diameter and 20 to 40

feet apart. The profile of this soil is the one described as representative for the series.

Included in mapping were small areas of yellowish-brown, severely eroded, shallow soils that have a silty clay loam or silty clay surface layer that is less than 3 inches thick. Most areas of these soils are in areas where woods have been cleared for pasture. Also included were small areas of dark-brown Fairmount soils that have slopes of less than 25 percent. Also included were small areas of moderately deep or deep, well-drained soils near the base of hillside slopes.

This soil is suited to trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe-2; woodland suitability group 7)

Gilpin Series

The Gilpin series consists of moderately deep, well-drained soils on uplands. These sloping to steep soils occupy short hillsides. They formed in thin loess and in material weathered from sandstone, siltstone, and shale bedrock.

In a representative profile, the surface layer is about 6 inches of brown, strongly acid silt loam. The subsurface layer is about 5 inches of yellowish-brown, strongly acid silt loam. The subsoil is about 14 inches of yellowish-brown, strongly acid, friable silty clay loam. Below this is about 5 inches of yellowish-brown, strongly acid, friable silt loam that overlies interbedded sandstone, siltstone, and shale bedrock.

Gilpin soils have moderate permeability and low available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid if not limed. Surface runoff is medium or rapid.

Representative profile of Gilpin silt loam, 6 to 12 percent slopes, eroded, in a wooded area where the slope is 11 percent and faces northeast, 500 feet north and 200 feet west of the southeast corner of the SW¼ sec. 12, T. 1 S., R. 5 E. in Clark County:

O1—2 inches to 1 inch, fresh hardwood leaves and twigs.

O2—1 inch to 0, partly decomposed leaves and twigs.

Ap—0 to 6 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; friable when moist; many small roots; strongly acid; clear, smooth boundary.

A2—6 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, granular and subangular blocky structure; friable when moist; many small roots; strongly acid; clear, smooth boundary.

B2t—11 to 19 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; friable when moist; many small roots; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on most peds; pale-brown (10YR 6/3) silt films in root channels; few sandstone fragments; strongly acid; clear, smooth boundary.

B3t—19 to 25 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; friable when moist; many small roots; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on many peds; pale-brown (10YR 6/3) silt films in root channels; 10 percent sandstone fragments by volume; strongly acid; clear, smooth boundary.

C—25 to 30 inches, yellowish-brown (10YR 5/6) heavy silt loam; massive; friable when moist; few small roots; 20 percent sandstone fragments by volume; strongly acid; clear, smooth boundary.

R—30 inches, interbedded sandstone, siltstone, and shale bedrock.

The solum ranges from 15 to 30 inches in thickness. Depth to sandstone and shale bedrock ranges from 20 to 36 inches. The solum below the Ap horizon is strongly acid or very strongly acid. The Ap horizon ranges from dark brown (10YR 4/3) to light yellowish brown (10YR 6/4). It is strongly acid to neutral, depending on the amount of lime applied. The B horizon has a matrix color of strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6) and ranges from silt loam to silty clay loam. It ranges from 9 to 18 inches in thickness. Generally, the B3 horizon contains enough sand to have a gritty feel. The C horizon is silt loam or channery silt loam. Volume of sandstone and shale fragments ranges from 5 to 30 percent in the C horizon.

Gilpin soils formed in materials similar to those in which the Berks and Zanesville soils formed. Gilpin soils occupy areas adjacent to excessively drained Berks soils, but they have a more clayey subsoil. Gilpin soils have a thinner solum, have a redder subsoil, and lack the fragipan of Zanesville soils.

Gilpin silt loam, 6 to 12 percent slopes, eroded (GlC2).—This soil occupies narrow ridges and hillsides. The profile of this soil is the one described as representative for the series. The plow layer is 3 to 7 inches thick. The surface layer is brown to yellowish brown. Included in mapping were small areas of Gilpin soils that have a surface layer 7 to 10 inches thick and of Gilpin soils that have a surface layer less than 3 inches thick. Also included were small areas of deep, well drained to moderately well drained Zanesville soils.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe-8; woodland suitability group 10)

Gilpin silt loam, 6 to 12 percent slopes, severely eroded (GlC3).—This soil occupies narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is yellowish brown and is less than 3 inches thick. Also, it is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were small areas of Gilpin soils that have a surface layer 3 to 7 inches thick. Also included were small areas of deep, well drained to moderately well drained Zanesville soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 10)

Gilpin silt loam, 12 to 18 percent slopes, eroded (GlD2).—This soil occupies narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 22 inches. The surface layer is brown to yellowish brown. Included in mapping were small areas of deep, well drained to moderately well drained Zanesville soils and moderately deep, excessively drained Berks soils. Also included were a few small areas of Gilpin soils that have a surface layer less than 3 inches thick.

This soil is better suited to permanent pasture or trees than to cultivated crops. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 10)

Gilpin silt loam, 12 to 18 percent slopes, severely eroded (GlD3).—This soil occupies narrow ridges and hill-

sides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is yellowish brown and is less than 3 inches thick. Also, the surface layer is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. The surface layer and subsoil combined are about 20 inches thick. Included in mapping were small areas of deep, well drained to moderately well drained Zanesville soils and moderately deep, excessively drained Berks soils. Also included were a few small areas of Gilpin soils that have a surface layer 3 to 7 inches thick.

This soil is better suited to permanent pasture and trees than to cultivated crops. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe-1; woodland suitability group 10)

Gilpin silt loam, 18 to 25 percent slopes, eroded (GlE2).—This soil occupies narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 18 inches and depth to bedrock is about 2 feet. The surface layer is brown to yellowish brown. Included with this soil in mapping were small areas of moderately deep, excessively drained Berks soils. Also included were a few small areas of Gilpin soils that have a surface layer less than 3 inches thick.

This soil is better suited to permanent pasture or trees than to cultivated crops. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 10)

Grayford Series

The Grayford series consists of deep, well-drained soils on uplands. These soils are nearly level and gently sloping where they are on ridges and sloping to steep where they are on hillsides. Grayford soils formed in loess and glacial till, and the underlying material weathered from limestone.

In a representative profile, the surface layer is about 7 inches of dark-brown, medium acid silt loam. The subsoil is about 71 inches thick. The upper part of the subsoil is 59 inches of reddish-brown, very strongly acid to medium acid, friable silt loam and silty clay loam. The lower part is reddish-brown, medium acid to neutral, firm to very firm clay. Below this is limestone bedrock.

Grayford soils have moderately slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow to rapid. There are sinkholes in some places.

Representative profile of Grayford silt loam, 6 to 12 percent slopes, eroded, in a cultivated field where the slope is 8 percent and faces southwest, 2,500 feet southeast of the northwest corner and 1,250 feet northeast of the west boundary of Clark Grant 100 in Clark County:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; splotches of yellowish red (5YR 4/6) from B1 horizon; moderate, medium, granular structure; friable when moist; many small roots; medium acid; clear, smooth boundary.

B1t—7 to 16 inches, reddish-brown (5YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable when moist; many small roots; many fine pores; thin discontinuous clay films on few peds; slightly acid; clear, smooth boundary.

B21t—16 to 29 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable when moist; few small roots; many fine pores; few fine iron and manganese concretions; thin discontinuous clay films on many peds; strongly acid; clear, smooth boundary.

IIB22t—29 to 38 inches, reddish-brown (2.5YR 4/4) silty clay loam; few, medium, distinct, yellowish-red (5YR 5/8) and light yellowish-brown (10YR 6/4) mottles; moderate, medium, subangular blocky structure; friable when moist; thin discontinuous clay films on many peds; many small till pebbles; very strongly acid; clear, smooth boundary.

IIB23t—38 to 49 inches, reddish-brown (5YR 4/4) silt loam; many mottles of light yellowish brown (10YR 6/4); moderate, medium, subangular blocky structure; friable to very friable when moist; thin discontinuous clay films on many peds; many iron and manganese concretions; many small till pebbles; very strongly acid; clear, smooth boundary.

IIB24t—49 to 60 inches, reddish-brown (5YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable to very friable when moist; thin discontinuous clay films on many peds; many iron and manganese concretions; many small glacial till pebbles; medium acid; clear, smooth boundary.

IIB25t—60 to 66 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable when moist; thick discontinuous films on many ped faces; many manganese concretions; few till pebbles; medium acid; clear, smooth boundary.

IIIB31t—66 to 72 inches, reddish-brown (5YR 4/4) clay; massive; firm when moist; thick clay films; abundant manganese concretions; medium acid; clear, smooth boundary.

IIIB32t—72 to 78 inches, yellowish brown (10YR 5/8) clay; common, fine, prominent, weak-red (10R 5/3) mottles; massive; very firm when moist; abundant thick clay films; few manganese concretions; neutral reaction; clear, smooth boundary.

R—78 inches, limestone bedrock.

The solum ranges from 60 inches to more than 78 inches in thickness. Loess ranges from 18 to 48 inches in thickness. Depth to limestone bedrock ranges from 60 to 96 inches. The Ap horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). It is strongly acid to neutral, depending on the amount of lime applied. The B2 horizon has a matrix color of reddish brown (2.5YR 4/4) to yellowish brown (10YR 5/8). The IIB23t horizon commonly has enough sand to have a gritty feel.

Grayford soils are on slopes adjacent to well-drained Crider soils. They have drainage similar to that of Cincinnati and Crider soils. Grayford soils have a subsoil formed partly in till, which Crider soils lack, and they are less clayey, less red, and more friable than Crider soils. Grayford soils lack a fragipan, which Cincinnati soils have, and they have a redder and more clayey subsoil than Cincinnati soils.

Grayford silt loam, 0 to 2 percent slopes (GrA).—This soil occupies narrow ridges. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark grayish brown and is 9 to 12 inches thick. Also, the loess mantle is about 40 inches thick. Included in mapping were a few small areas of deep, well-drained Cincinnati and Crider soils. Also included were a few small areas of deep, moderately well drained Rossmoyne soils.

This soil is well suited to corn, soybeans, and small grain. It has few, if any, limitations. (Capability unit I-1; woodland suitability group 1)

Grayford silt loam, 2 to 6 percent slopes, eroded (GrB2).—This soil occupies narrow ridges and short breaks between nearly level ridges and sloping hillsides. The profile of this soil is similar to that described as representative for the series, except that the loess mantle is

about 35 inches thick. Included in mapping were a few small areas of deep, well-drained Crider and Cincinnati soils. Also included were small areas of Grayford soils that have a surface layer 9 to 12 inches thick and small areas of deep, moderately well drained Rossmoyne soils. In some places there are depressions and sinkholes. The more prominent ones are shown on the map by spot symbols.

This soil is well suited to corn (fig. 4), soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe-3; woodland suitability group 1)

Grayford silt loam, 6 to 12 percent slopes, eroded (GrC2).—This soil occupies ridges and hillsides. The profile of this soil is the one described as representative for the series. Included in mapping were small areas of deep, well-drained Crider and Cincinnati soils. A few small areas of Grayford soils that have a surface layer less than 3 inches thick and small areas of deep, moderately well drained Rossmoyne soils were also included. In some places there are depressions and sinkholes. The more prominent ones are shown on the map by spot symbols.

This soil is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe-3; woodland suitability group 1)

Grayford silt loam, 6 to 12 percent slopes, severely eroded (GrC3).—This soil occupies ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark brown to reddish brown and is less than 3 inches thick. Also the surface layer is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than that of the profile described as representative for the series. Included in mapping were small areas of deep, well-drained Cincinnati and Crider soils. Also included were small areas of Grayford soils that have a surface layer 3 to 9 inches thick and small areas of deep, moderately well drained Rossmoyne soils. In some places there are depressions and sinkholes. The more prominent ones are shown on the map by spot symbols.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards in use and management. (Capability unit IVe-3; woodland suitability group 1)

Grayford silt loam, 12 to 18 percent slopes, eroded (GrD2).—This soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the loess mantle is about 24 inches thick, the combined thickness of the surface layer and subsoil is less, and depth to bedrock is about 65 inches.

Figure 4.—Alfalfa and corn on Grayford silt loam, 2 to 6 percent slopes, eroded.

Included in mapping were small areas of deep, well-drained Crider soils. Also included were a few small areas of Grayford soils that have a surface layer less than 3 inches thick. In some places there are areas of a well-drained soil that is less than 60 inches deep to limestone bedrock. In some places there are depressions, sinkholes, and rock outcrops. The more prominent areas are shown on the map by spot symbols.

The soil is poorly suited to corn, soybeans, and small grain. It is excellent for alfalfa. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–3; woodland suitability group 1)

Grayford silt loam, 12 to 18 percent slopes, severely eroded (GrD3).—This soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the loess mantle is about 22 inches thick, the combined thickness of the surface layer and subsoil is less, and depth to bedrock is about 63 inches. Also, the surface layer is dark brown to reddish brown and less than 3 inches thick. It is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were small areas of deep, well-drained Crider soils. Also included were a few small areas of Grayford soils that have a surface layer 3 to 9 inches thick. In some places there are areas of a well-drained soil that is less than 60 inches deep to limestone bedrock. In some places there are depressions, sinkholes, and rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is suited to permanent pasture or trees. Erosion and runoff are hazards in use and management. (Capability unit VIe–1; woodland suitability group 1)

Grayford silt loam, 18 to 25 percent slopes, eroded (GrE2).—This steep soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is less and depth to bedrock is about 60 inches. Included in mapping were small areas of deep, well-drained Crider soils. Also included were a few small areas of Grayford soils that have a surface layer less than 3 inches thick. In some places there are areas of a well-drained soil that is less than 60 inches deep over limestone bedrock. In some places there are rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is suited to permanent pasture and trees. Erosion and runoff are hazards in use and management. (Capability unit VIe–1; woodland suitability group 6)

Gullied Land

Gullied land (Gu) consists of severely gullied areas. Limestone, shale, or sandstone bedrock is 4 to 6 feet below the surface in most places, but bedrock crops out in many of the gullies. Most areas of the original soils have been destroyed, except on narrow ridges between the gullies. The areas of soils that remain on the narrow ridges are remnants of the Corydon, Crider, Gilpin, Grayford, Hagerstown, Rarden, Trappist, and Zanesville soils. The remaining soil material, except for that on the upper part of the narrow ridges, is generally firm, clayey material.

Most of this land type is bare of vegetation, but in a few areas shrubs, weeds, and wild grasses are starting to grow. The soil material between the gullies can be stabilized by planting pine trees. (Capability unit VIIe–1; woodland suitability group 14)

Hagerstown Series

The Hagerstown series consists of deep, well-drained soils on uplands. These soils are sloping to steep and are on ridges and hillsides. They formed in a thin layer of loess, and the underlying material weathered from limestone.

In a representative profile, the surface layer is about 6 inches of dark-brown and dark yellowish-brown, medium acid silt loam. The subsoil is about 44 inches thick. The upper 3 inches is dark-brown, medium acid, friable silt loam. The next 7 inches is reddish-brown, strongly acid, firm silty clay loam. The lower part is dark-red to dark reddish-brown, strongly acid to slightly acid, firm silty clay and clay. Below this is limestone bedrock.

Hagerstown soils have slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is medium to rapid. There are sinkholes in some places.

Representative profile of Hagerstown silt loam, 6 to 12 percent slopes, eroded, in a wooded area where the slope is 8 percent and faces south, 875 feet southeast of the northwest corner and 625 feet northeast of the west boundary of Clark Grant 100 in Clark County:

O1—1 inch to 0, fresh pine needles and hardwood leaves.

Ap—0 to 6 inches, dark-brown (7.5YR 4/4) and dark yellowish-brown (10YR 3/4) silt loam; moderate, fine and medium, granular structure; friable when moist; many small and medium roots; medium acid; clear, smooth boundary.

B1—6 to 9 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable when moist; many small roots; medium acid; clear, wavy boundary.

B21t—9 to 16 inches, reddish-brown (5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm when moist; many small roots; yellowish-red (5YR 5/6) silt films on few peds; thin discontinuous clay films on many peds; strongly acid; abrupt, smooth boundary.

IIB22t—16 to 32 inches, dark-red (2.5YR 3/6) silty clay; strong, medium, subangular blocky structure; firm when moist; sticky when wet; many small roots; thin continuous clay films on many peds; few iron and manganese concretions; strongly acid; clear, wavy boundary.

IIB23t—32 to 50 inches, dark reddish-brown (2.5YR 3/4) silty clay to clay; common, fine, prominent, strong-brown (7.5YR 5/6) mottles; strong, medium, angular and subangular blocky structure; firm when moist; sticky when wet; few small roots; thin and thick continuous clay films on many peds; many iron and manganese concretions; slightly acid; gradual, irregular, boundary.

R—50 inches, limestone bedrock.

The solum ranges from 42 to 60 inches in thickness. Loess is dominantly less than 18 inches thick. Depth to bedrock ranges from 40 to 60 inches. The solum below the Ap horizon is dominantly strongly acid or very strongly acid, except near bedrock, where it is slightly acid or neutral. The Ap horizon ranges from dark brown (7.5YR 3/2) to dark yellowish brown (10YR 4/4). It is strongly acid to neutral, depending on the amount of lime applied. The B2 horizon has a matrix color of red (10R 4/6) to strong brown (7.5YR 5/6). Consistence is firm or very firm.

Hagerstown soils occupy areas adjacent to well-drained Crider soils. Hagerstown soils formed in materials similar to those in which Corydon and Crider soils formed. Hagerstown soils have a thicker solum, have a redder and less clayey subsoil, and are deeper to limestone bedrock than Corydon soils. They have a thinner loess mantle and the upper part of the subsoil is more clayey than that of Crider soils.

Hagerstown silt loam, 6 to 12 percent slopes, eroded (HaC2).—This soil occupies ridges and hillsides. The profile of this soil is the one described as representative for the series. Included in mapping were small areas of deep, well-drained Crider soils and a deep, well-drained cherty soil that has a loess mantle less than 18 inches thick. Also included are a few areas of Hagerstown soils that have a surface layer less than 3 inches thick. In some places there are rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe–3; woodland suitability group 1)

Hagerstown silt loam, 12 to 18 percent slopes, eroded (HaD2).—This soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the loess mantle is about 14 inches thick. The surface layer is dark brown. Included in mapping were small areas of deep, well-drained Crider soils and a deep, well-drained cherty soil that has a loess mantle less than 18 inches thick. Also included were a few small areas of Hagerstown soils that have a surface layer less than 3 inches thick. In some places there are areas of a well-drained soil that is less than 40 inches deep to limestone bedrock. In some places there are rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is poorly suited to corn, soybeans, and small grain. It is excellent for alfalfa. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–3; woodland suitability group 1)

Hagerstown silt loam, 18 to 25 percent slopes, eroded (HaE2).—This soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the loess mantle is about 10 inches thick. The surface layer is dark brown. Included in mapping were small areas of deep, well-drained Crider soils and a deep, well-drained cherty soil that has a loess mantle less than 18 inches thick. Also included were Hagerstown soils that have a surface layer less than 3 inches thick. In some places there are areas of a well-drained soil that is less than 40 inches to limestone bedrock. In some places there are rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe–1; woodland suitability group 6)

Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded (HcC3).—This soil occupies ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark-brown silty clay loam and is less than 3 inches thick. Also the surface layer is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were small areas of deep, well-drained Crider soils and a deep, well-drained cherty soil that has a loess mantle less than 18 inches thick. Also included were a few areas of Hagerstown soils that have a surface layer 3 to 8 inches thick. In some places there are rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–3; woodland suitability group 1)

Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded (HcD3).—This soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark-brown silty clay loam less than 3 inches thick and the loess mantle is about 12 inches thick. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were small areas of deep, well-drained Crider soils and a deep, well-drained cherty soil that has a loess mantle less than 18 inches thick. Also included were a few small areas of Hagerstown soils that have a surface layer 3 to 8 inches thick. In some places there are areas of a well-drained soil that is less than 40 inches deep to limestone bedrock. In some places there are rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe–1; woodland suitability group 1)

Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded (HcE3).—This soil occupies hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark-brown silty clay loam, less than 3 inches thick, and the loess mantle is about 8 inches thick. Included in mapping were small areas of deep, well-drained Crider soils and a deep, well-drained cherty soil that has a loess mantle less than 18 inches thick. Also included were areas of soils that have a surface layer 3 to 8 inches thick. In some places there are areas of a well-drained soil that is less than 40 inches deep to limestone bedrock. In some places there are rock outcrops. The more prominent areas are shown on the map by spot symbols.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe–1; woodland suitability group 6)

Haymond Series

The Haymond series consists of deep, well-drained soils on bottom lands that are subject to seasonal flooding. These soils are along most of the larger streams in the area. They are nearly level and occupy long, narrow areas adjacent to stream channels. These soils formed in recent mixed alluvium that is medium or slightly acid.

In a representative profile, the surface layer is about 8 inches of dark grayish-brown and dark-brown, slightly

acid silt loam. The subsoil is more than 52 inches of dark-brown, slightly acid, friable silt loam. The upper 24 inches has dark-brown and grayish-brown mottles. The lower part has yellowish-brown and gray mottles.

Haymond soils have moderate permeability and high available water capacity. They are low in organic-matter content and moderate in natural fertility. The plow layer is medium acid or slightly acid in areas not limed. Surface runoff is slow.

Representative profile of Haymond silt loam in a cultivated field 40 feet east of Silver Creek, in the northeast corner of the southeast quarter of Clark Grant 203 in Clark County:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) and dark-brown (10YR 4/3) silt loam; weak, thin, platy structure breaking to weak, fine, granular structure; friable when moist; abundant roots; slightly acid; abrupt, smooth boundary.

B21—8 to 15 inches, dark-brown (10YR 4/3) silt loam (10 to 18 percent clay); weak, very fine, granular structure; friable when moist; common, medium, distinct, dark grayish-brown (10YR 4/2) wormcasts; abundant roots; slightly acid; gradual, wavy boundary.

B22—15 to 32 inches, dark-brown (10YR 4/3) silt loam (10 to 18 percent clay); weak, fine, granular structure; friable when moist; few, medium, distinct, grayish-brown (10YR 5/2) wormcasts; abundant roots; slightly acid; gradual, wavy boundary.

B23—32 to 60 inches, dark-brown (10YR 4/3) silt loam (10 to 18 percent clay); many, medium, distinct, yellowish-brown (10YR 5/6), gray (10YR 5/1), and dark-brown (7.5YR 3/2) mottles; massive; friable when moist; few roots; many iron and manganese concretions; slightly acid.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock ranges from 48 to 84 inches. The solum is medium acid or slightly acid. The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). The B horizon has matrix colors of dark brown (10YR 4/3) to yellowish brown (10YR 5/4).

Haymond soils formed in materials similar to those of adjacent, moderately well drained Wilbur soils and have less mottling in the upper part of the subsoil. Haymond soils have a thicker solum, are less acid, and are siltier than Pope soils, which are also on bottom lands.

Haymond silt loam (Hd).—This nearly level soil occupies long, narrow areas. Included in mapping were a few small areas of deep, moderately well drained Wilbur soils. Also included were small areas of well-drained soils on bottom lands that are strongly acid and have a silt loam or fine sandy loam surface layer. In some places there are sandy spots. The more prominent ones are shown on the map by spot symbols.

This soil is well suited to corn and soybeans. The main hazard is flooding between December and June. Small grain and alfalfa (fig. 5) are subject to severe damage

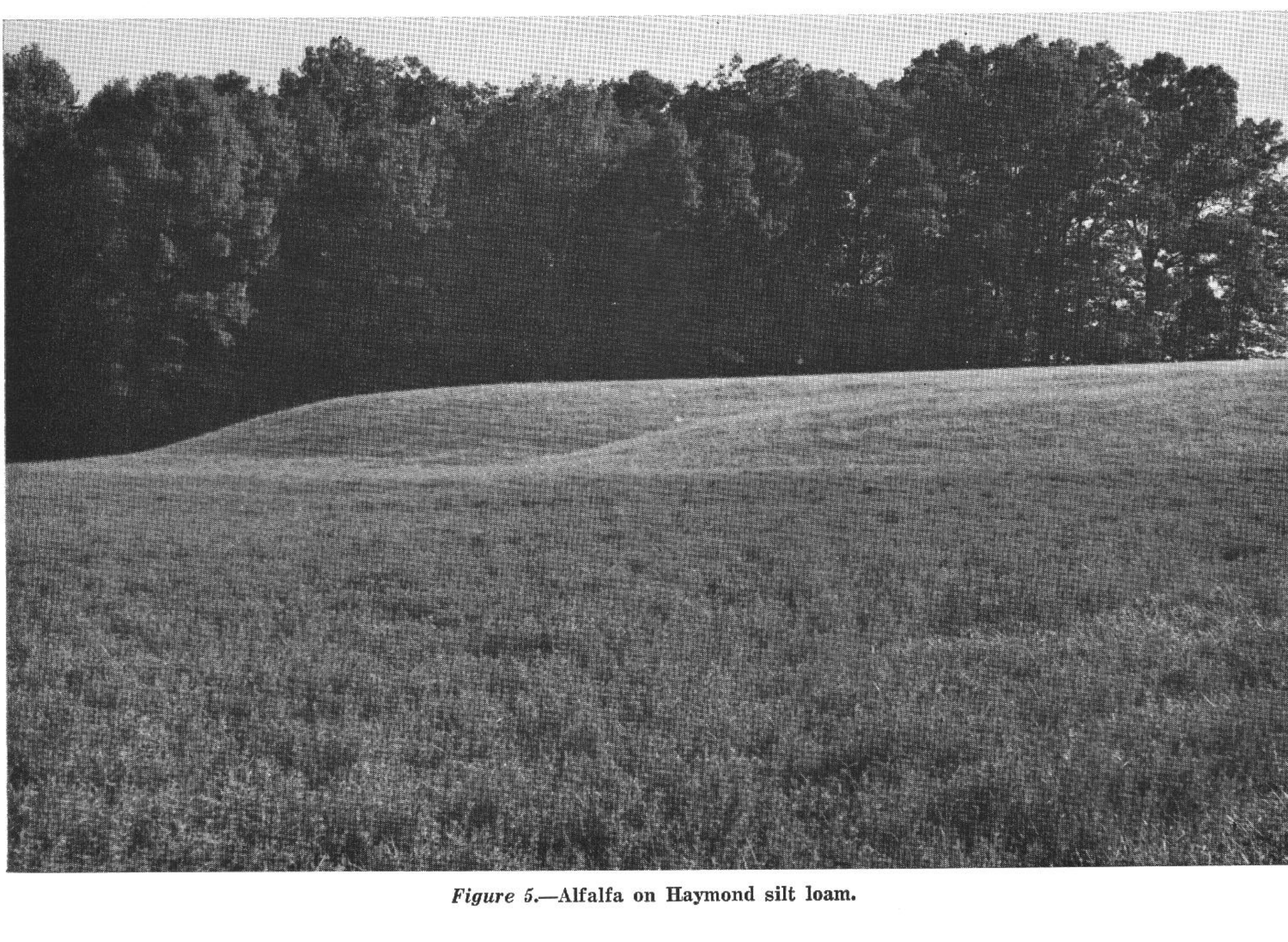

Figure 5.—Alfalfa on Haymond silt loam.

during prolonged periods of flooding. (Capability unit I-2; woodland suitability group 8)

Henshaw Series

The Henshaw series consists of deep, somewhat poorly drained soils on terraces. These soils are nearly level and occupy areas between higher lying soils on uplands and lower lying soils on terraces or bottom lands. They formed in loess and calcareous, moderately fine textured, stratified sediment deposited by slack water.

In a representative profile, the surface layer is about 8 inches of gray, slightly acid silt loam that has black mottles. The subsurface layer is about 6 inches of dark grayish-brown, medium acid silt loam that has yellowish-brown mottles. The subsoil is about 44 inches thick, dark yellowish-brown, and has grayish-brown mottles. The upper 39 inches is medium acid, firm silty clay loam. The lower part is neutral, firm silt loam. Below this is light olive-brown, calcareous, firm silty clay that has gray mottles.

Henshaw soils have moderately slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The surface layer is dominantly strongly acid in areas not limed. Surface runoff is slow.

Representative profile of Henshaw silt loam, 0 to 2 percent slopes, in a wooded area where the slope is 1 percent, 1,000 feet southeast of the northwest corner and 375 feet northeast of the west boundary of Clark Grant 46 in Clark County:

Ap—0 to 8 inches, gray (10YR 5/1) silt loam; few, fine, prominent, black (10YR 2/1) mottles; moderate, medium and coarse, granular structure; friable when moist; many small roots; slightly acid; abrupt, smooth boundary.

A2—8 to 14 inches, dark grayish-brown (10YR 4/2) silt loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; friable when moist; medium acid; clear, smooth boundary.

B21t—14 to 34 inches, dark yellowish-brown (10YR 4/4) silty clay loam; common, coarse, distinct, grayish-brown (10YR 5/2) mottles; moderate, coarse, angular blocky structure; firm when moist; thin, discontinuous, gray (10YR 6/1) clay films on many peds; medium acid; clear, wavy boundary.

B22t—34 to 53 inches, dark yellowish-brown (10YR 4/4) silty clay loam; common, coarse, angular blocky structure; firm when moist; thin, discontinuous, gray (10YR 6/1) clay films on many peds; many black (10YR 2/1) iron and manganese concretions; medium acid; clear, smooth boundary.

B3—53 to 58 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; common, fine, faint, grayish-brown (10YR 5/2) mottles; massive; firm when moist; neutral; clear, smooth boundary.

IIC1—58 to 68 inches, light olive-brown (2.5Y 5/4) silty clay; common, medium, distinct, gray (N 5/0) mottles; massive; firm when moist; calcareous; clear, smooth boundary.

IIC2—68 to 75 inches, stratified layers of silty clay, silty clay loam, and silt; many soft and hard carbonate concretions; calcareous.

The solum ranges from 40 to 70 inches in thickness. Loess ranges from 30 to 48 inches in thickness. Depth to bedrock ranges from 15 to 20 feet. The Ap horizon ranges from gray (10YR 5/1) to dark brown (10YR 4/3). It is strongly acid to neutral, depending on the amount of lime applied. The B2 horizon has a matrix color of dark brown (10YR 4/3) to yellowish brown (10YR 5/4) and is silt loam or silty clay loam. Consistence is firm or very firm. The C horizon has a matrix color of light olive brown (2.5Y 5/4) to yellowish brown (10YR 5/6). It has stratified layers of silty clay, silty clay loam, and fine sand. Calcareous nodules are in the C horizon in some places.

Henshaw soils formed in materials similar to those in which Uniontown and Zipp soils formed. Henshaw soils occupy areas adjacent to the well drained to moderately well drained Uniontown soils, but they have more mottling in the upper part of their subsoil. Henshaw soils have a less gray and less clayey subsoil and lack the dark-colored surface layer of Zipp soils.

Henshaw silt loam, 0 to 2 percent slopes (HeA).—This soil occupies broad terraces. Included in mapping were a few small areas of deep, moderately well drained Uniontown soils. Also included were small areas of a deep, somewhat poorly drained soil that has a silty clay or clay subsoil and contains carbonates at a depth of about 3 feet.

This soil is well suited to corn and soybeans. Runoff is slow, and wetness is the main limitation. (Capability unit IIw-2; woodland suitability group 5)

Hickory Series

The Hickory series consists of deep, well-drained soils on uplands. These are steep soils on hillsides. They formed in loam to clay loam glacial till that has a shallow layer of loess, generally 20 inches or less in thickness. Below the till is limestone or shale bedrock.

In a representative profile, the surface layer is about 2 inches of dark grayish-brown, medium acid silt loam. The subsurface layer is about 8 inches of yellowish-brown, medium acid silt loam. The subsoil is about 38 inches thick. The upper 20 inches is dark yellowish-brown, medium acid, friable and firm silty clay loam and clay loam. The lower part is dark-brown, slightly acid to neutral, firm clay loam. The underlying material is yellowish-brown, calcareous, friable loam till.

Hickory soils have moderately slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is rapid or very rapid.

Representative profile of Hickory silt loam, 18 to 25 percent slopes, eroded, in a wooded area where the slope is 24 percent and faces north, 700 feet northeast of the northwest corner and 50 feet southeast of the north boundary of Clark Grant 124 in Clark County:

O1—1½ inches to ½ inch, fresh hardwood leaves and twigs.

O2—½ inch to 0, partly decomposed leaves, twigs, and roots.

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable when moist; many small roots; medium acid; abrupt, smooth boundary.

A2—2 to 10 inches, yellowish-brown (10YR 5/4) silt loam; moderate, fine, granular structure; friable when moist; many small roots; medium acid; abrupt, smooth boundary.

B1—10 to 14 inches, dark yellowish-brown (10YR 4/4) silty clay loam; weak, moderate, subangular blocky structure; friable when moist; few small glacial till pebbles; medium acid; clear, smooth boundary.

B21t—14 to 30 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; many small glacial till pebbles; few iron and manganese concretions; thin, discontinuous, dark-brown (10YR 4/3) clay films on many peds; medium acid; clear, smooth boundary.

B22t—30 to 42 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; many small glacial till pebbles; few iron and manganese concretions; thin, discontinuous, dark-brown (10YR 4/3) clay films on many peds; slightly acid; clear, smooth boundary.

B3—42 to 48 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; abundant small glacial till pebbles; few iron and manganese concretions; neutral; clear, smooth boundary.

C—48 to 60 inches, yellowish-brown (10YR 5/4) loam till; massive; friable when moist; calcareous.

The solum ranges from 20 to 60 inches in thickness. Loess ranges from 0 to 20 inches in thickness. Depth to carbonates ranges from 30 inches to more than 60 inches. Depth to limestone or shale bedrock ranges from 3½ feet to more than 10 feet. The A1 horizon ranges from gray (10YR 5/1) to dark grayish brown (10YR 4/2). It is silt loam or loam that ranges from strongly acid to slightly acid. The B2 horizon is dark brown (7.5YR 4/4) to yellowish brown (10YR 5/4) and ranges from loam to clay loam. Consistence is friable or firm. The C horizon ranges from grayish-brown (10YR 5/2) to yellowish-brown (10YR 5/4) loam to clay loam that has weathered from calcareous till.

Hickory soils have drainage similar to that of Cincinnati, Grayford, and Trappist soils and are in areas adjacent to well-drained Cincinnati soils. Hickory soils are similar to Cincinnati soils but have a thinner loess mantle, have carbonates closer to the surface, and lack a fragipan. The subsoil of Hickory soils is not so acid, red, or clayey as that of Grayford soils. Hickory soils are deeper, less acid, and less clayey in the subsoil than Trappist soils.

Hickory silt loam, 18 to 25 percent slopes, eroded (HkE2).—This soil occupies hillsides. It has a surface layer that is 3 to 9 inches thick. Included in mapping were small areas of deep, well-drained Cincinnati soils and small areas of a deep, well-drained soil formed in stratified silt loam and silty clay loam and that has a fragipan. In places there are small areas of deep, well-drained Grayford soils and Hickory soils that have slopes steeper than 25 percent. Also included were Hickory soils that have a surface layer less than 3 inches thick and small areas of moderately deep, well-drained Trappist soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 2)

Hosmer Series

The Hosmer series consists of deep, well-drained soils on uplands. These nearly level to strongly sloping soils are on ridges and hillsides. They formed in deep loess that overlies black shale in most places. These soils have a slowly permeable fragipan.

In a representative profile, the surface layer is about 7 inches of dark grayish-brown, neutral silt loam. The subsurface layer is about 3 inches of yellowish-brown, neutral silt loam. The subsoil is about 70 inches of silt loam. The upper 19 inches is yellowish brown to strong brown, slightly acid to medium acid, and friable. The next 31 inches is a dark yellowish-brown, strongly acid, very firm and brittle fragipan. The lower part is mottled light brownish-gray and yellowish-brown, strongly acid, friable silt loam. The underlying material is brown, medium acid, friable clay loam.

Hosmer soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The surface layer is dominantly strongly acid in areas not limed. Surface runoff is slow to rapid.

Representative profile of Hosmer silt loam, 0 to 2 percent slopes, on the side of a limestone quarry, 2,750 feet southeast of the northwest corner and 375 feet northeast of the west boundary of Clark Grant 10 in Clark County:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; dark grayish-brown wormcasts; neutral; abrupt, smooth boundary.

A2—7 to 10 inches, yellowish-brown (10YR 5/4) silt loam; moderate, fine, granular structure; friable when moist; neutral.

B1—10 to 13 inches, yellowish-brown (10YR 5/6) silt loam; weak, medium, subangular blocky structure; friable when moist; slightly acid; gradual, wavy boundary.

B2t—13 to 29 inches, strong-brown (7.5YR 5/8) heavy silt loam; moderate, medium, subangular blocky structure; friable when moist; thin, discontinuous, yellowish-brown (10YR 5/4) clay films on many peds; few iron and manganese concretions; medium acid; clear, wavy boundary.

Bx1t—29 to 42 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; many, medium, distinct, brown (10YR 5/3) and strong-brown (7.5YR 5/8) mottles; moderate, coarse, prismatic structure breaking to moderate, coarse, subangular blocky structure; very firm and brittle when moist; thin, discontinuous, yellowish-brown (10YR 5/4) clay films on many peds; light-gray (10YR 7/2) silt coatings on all peds; silt coatings up to ½ inch thick on prism heads; strongly acid; clear, wavy boundary.

Bx2—42 to 60 inches, dark yellowish-brown (10YR 4/4) silt loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; strong, very coarse, prismatic structure (massive inside peds); very firm and brittle when moist; thick, light-gray (10YR 7/2) silt films on peds; silt coating up to ½ inch thick on prism heads; few iron and manganese concretions; strongly acid; clear, wavy boundary.

B3—60 to 80 inches, mottled light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8) silt loam; moderate, coarse, prismatic structure; friable when moist; thin light-gray (10YR 7/2) silt films on peds; few iron and manganese concretions; strongly acid.

IIC—80 to 90 inches, brown (10YR 5/3) light clay loam; massive; friable when moist; many till pebbles; medium acid.

The solum ranges from 60 to 84 inches in thickness. Loess ranges from 48 to 84 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches. Depth to bedrock ranges from 8 to 12 feet. The Ap horizon is dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). The Ap horizon is strongly acid to neutral, depending on the amount of lime applied. It is silt loam or silty clay loam.

The Bx horizon has a matrix color of dark brown (7.5YR 4/4) to yellowish brown (10YR 5/6) and is silt loam or silty clay loam. Structure of the Bx horizon is strong or very strong, medium or coarse, and prismatic, and in places the prisms break into blocky peds. Consistence is firm or very firm. It is strongly acid or very strongly acid. The C horizon is gritty silt loam to clay loam.

Hosmer soils occupy areas adjacent to well-drained Cincinnati soils. These soils have thicker loess and less till than Cincinnati soils.

Hosmer silt loam, 0 to 2 percent slopes (HoA).—This soil occupies narrow ridges and knolls. The profile of this soil is the one described as representative for the series. Included in mapping were a few small areas of a deep, somewhat poorly drained soil that has a fragipan. Also included were small areas of a deep, moderately well

drained soil that has a fragipan. This inclusion has a loess mantle 40 to 55 inches thick and is 45 to 60 inches deep to black shale or limestone bedrock.

This soil is well suited to corn, soybeans, and small grain. Runoff is slow, and wetness is the main limitation. (Capability unit IIw–5; woodland suitability group 9)

Hosmer silt loam, 2 to 6 percent slopes, eroded (HoB2).—This soil occupies narrow ridges and short breaks between nearly level soils on ridges and sloping soils on hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is yellowish brown and is 3 to 9 inches thick. Included in mapping were a few small areas of nearly level Hosmer soils and small areas of Hosmer soils that have a surface layer 9 to 10 inches thick. Also included were small areas of a moderately well drained soil that has a fragipan. This inclusion has a loess mantle 40 to 55 inches and is 45 to 60 inches deep to black shale or limestone bedrock.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–7; woodland suitability group 9)

Hosmer silt loam, 6 to 12 percent slopes, eroded (HoC2).—This soil occupies ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is yellowish brown and is 3 to 9 inches thick. Also, depth to the fragipan is about 24 inches. Included in mapping were small areas of deep, well-drained Cincinnati soils. Also included were areas of Hosmer soils that have a surface layer less than 3 inches thick.

This soil is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe–7; woodland suitability group 9)

Hosmer silt loam, 6 to 12 percent slopes, severely eroded (HoC3).—This soil occupies ridges and hillsides. A few rills and small gullies are common. The profile of this soil is similar to that described as representative for the series, except that the surface layer is yellowish brown and is less than 3 inches thick. Also, the surface layer is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. The depth to the fragipan is about 22 inches. Included with this soil in mapping were a few small areas of deep, well-drained Cincinnati soils and small areas of Hosmer soils that have a surface layer 3 to 9 inches thick.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main limitations in use and management. (Capability unit IVe–7; woodland suitability group 9)

Hosmer silt loam, 12 to 18 percent slopes, eroded (HoD2).—This soil occupies hillside slopes that are smooth and nearly uniform. A few rills are common. The profile of this soil is similar to that described as representative for the series, except that the surface layer is mainly yellowish brown and is 3 to 9 inches thick. Also, the depth to the fragipan is about 20 inches. Included in mapping were small areas of deep, well-drained Cincinnati soils and small areas of Hosmer soils that have a surface layer less than 3 inches thick.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–7; woodland suitability group 9)

Huntington Series

The Huntington series consists of deep, well-drained soils on bottom lands that are subject to occasional flooding. These soils are along the Ohio River. They are nearly level and are in long, narrow areas adjacent to the river channel. They formed in recent, neutral, micaceous alluvium of mixed origin that has limestone as a significant component.

In a representative profile, the surface layer is about 15 inches of dark-brown, neutral silt loam. The subsoil is 45 inches thick and is neutral, friable silt loam. The upper 21 inches is dark brown, and the lower part is dark yellowish brown.

Huntington soils have moderate permeability and high available water capacity. They are moderate in organic-matter content and high in natural fertility. The plow layer is dominantly neutral in areas not limed. Surface runoff is slow.

Representative profile of Huntington silt loam in a cultivated field 1,500 feet northeast of the southwest corner and 250 feet northeast of the south boundary of Clark Grant 5 in Clark County:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, medium, granular structure; friable when moist; many dark-brown (10YR 3/3) wormcasts; common mica flakes; neutral; abrupt, smooth boundary.

A12—8 to 15 inches, dark-brown (10YR 3/3) silt loam; moderate, coarse, granular structure; friable when moist; many dark-brown (10YR 3/3) wormcasts; common mica flakes; neutral; clear, wavy boundary.

B21—15 to 36 inches, dark-brown (10YR 4/3) silt loam; weak, coarse, subangular blocky structure breaking to moderate, fine, granular structure; friable when moist; brown (10YR 5/3) silt films on few peds; few dark-brown (10YR 3/3) wormcasts; common mica flakes; neutral; gradual, wavy boundary.

B22—36 to 60 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, granular structure and weak, medium, subangular blocky structure; friable when moist; discontinuous dark grayish-brown (10YR 4/2) organic coatings on few peds and in root channels; few dark-brown (10YR 3/3) wormcasts; common mica flakes; neutral.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock ranges from 60 inches to more than 10 feet. The A horizon is silt loam or silty clay loam and ranges from 10 to 20 inches in thickness.

Huntington soils occupy areas adjacent to moderately well drained Lindside soils. They have less mottling in the subsoil than Lindside soils. Huntington soils have similar drainage but have a darker surface layer and are less acid than Haymond and Pope soils.

Huntington silt loam (Hu).—This soil occupies long, narrow areas. Included in mapping were a few small areas of Huntington soils that have a silty clay loam surface layer, and small areas of deep, well-drained bottom-land soils that have a dark yellowish-brown loam surface layer. Also included were small areas of deep, moderately well drained Lindside soils and small areas of sandy soils adjacent to stream channels.

This soil is well suited to corn and soybeans. The main hazard is occasional flooding. Small grain and alfalfa are

subject to severe damage during prolonged periods of flooding. (Capability unit I–2; woodland suitability group 8)

Jennings Series

The Jennings series consists of deep, well-drained soils on uplands. These nearly level and gently sloping soils are on narrow ridges and hillsides. They formed in thin loess over loam or clay loam glacial till that is underlain by material weathered from black shale bedrock. These soils have a slowly permeable fragipan.

In a representative profile, the surface layer is about 8 inches of dark-brown, neutral silt loam. The subsoil is about 52 inches thick. The upper 19 inches is yellowish-brown, slightly acid to very strongly acid, friable and firm silt loam that has dark-brown and pale-brown mottles. The next 23 inches is a fragipan of yellowish-brown, extremely acid, very firm and brittle silt loam to clay loam that has grayish-brown mottles. The lower part is gray and strong-brown, extremely acid, very firm, shaly clay loam. Below this is black shale bedrock.

Jennings soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow or medium.

Representative profile of Jennings silt loam, 2 to 6 percent slopes, eroded, in a cultivated field where the slope is 5 percent, 2,800 feet north of the southwest corner and 1,800 feet northeast of the west boundary of Clark Grant 167 in Clark County:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

B1—8 to 17 inches, yellowish-brown (10YR 5/6) heavy silt loam; moderate, medium, subangular blocky structure; friable when moist; slightly acid; clear, smooth boundary.

B2t—17 to 27 inches, yellowish-brown (10YR 5/6) heavy silt loam; common, fine, faint, dark-brown (10YR 4/4) and pale-brown (10YR 6/3) mottles; moderate, medium, subangular blocky structure; firm when moist; thin brown (7.5YR 4/4) discontinuous clay films on peds and as linings of voids; thin pale-brown (10YR 6/3) silt films on many peds; very strongly acid; clear, irregular boundary.

IIBx—27 to 50 inches, yellowish-brown (10YR 5/4 to 5/6) silt loam to light clay loam; many, medium, distinct, grayish-brown (10YR 5/2) mottles; strong, coarse, prismatic structure; very firm and brittle when moist; gray (10YR 6/1) silt coatings and cappings on tops of prisms and between prisms (these range in thickness from less than 1 millimeter to as much as 1 inch within the pedon); gray (10YR 5/1) clay films 1 to 5 millimeters thick on faces of most prisms; silt films cover many of the clay films; few shale rocks; common, black and brown, soft iron and manganese oxide concretions; extremely acid; clear, smooth boundary.

IIB3—50 to 60 inches, gray (N 6/0) and strong-brown (7.5YR 5/6) shaly clay loam; moderate, very coarse, prismatic structure breaking to moderate, thick, platy structure; very firm when moist; extremely acid.

IIIR—60 inches, black shale bedrock.

The solum ranges from 45 to 72 inches in thickness, which is the same as depth to bedrock. Depth to the fragipan ranges from about 18 to 30 inches. Depth to black shale bedrock ranges from 4 to 6 feet. The Ap horizon is typically brown (10YR 5/3 or 4/3) but ranges to dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4). The B2t horizon ranges from yellowish-brown (10YR 5/4 or 5/6) to strong-brown (7.5YR 5/6) or brown (7.5YR 5/4) heavy silt loam to silty clay loam. The Bx horizon is typically yellowish brown (10YR 5/4 or 5/6) but ranges to light yellowish brown (10YR 6/4) or brown (7.5YR 5/4) and strong brown (7.5YR 5/6). Mottles are gray (10YR 5/1) to yellowish brown (10YR 5/6). The Bx horizon ranges from light silty clay loam to loam or light clay loam.

Jennings soils are on slopes adjacent to moderately well drained Rossmoyne soils and well drained Cincinnati soils and are shallower to bedrock than these soils. Jennings soils formed in materials similar to those in which Trappist soils formed. They are deeper and have a yellower, less clayey subsoil than the Trappist soils, and they have a fragipan that Trappist soils lack.

Jennings silt loam, 0 to 2 percent slopes (JeA).—This soil occupies narrow ridges and knolls. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark grayish brown and is 9 to 12 inches thick. Also, the combined thickness of the surface layer and subsoil is about 70 inches and depth to the fragipan is about 30 inches. Included in mapping were small areas of Jennings soils that have a surface layer 3 to 9 inches thick and small areas of deep, well drained Cincinnati soils and deep, moderately well drained Rossmoyne soils. Also included were small areas of deep, well drained and moderately well drained soils that have a loess mantle more than 48 inches thick.

This soil is well suited to corn, soybeans, and small grain. Runoff is slow, and wetness is the main limitation. (Capability unit IIw–5; woodland suitability group 9)

Jennings silt loam, 2 to 6 percent slopes, eroded (JeB2).This soil occupies narrow ridges and short breaks between nearly level ridges and sloping hillsides. The profile of this soil is the one described as representative for the series. Included in mapping were a few small areas of Jennings soils that have a surface layer 9 to 12 inches thick and areas that have a surface layer less than 3 inches thick. Also included were small areas of deep, well-drained Cincinnati soils, of deep, moderately well drained Rossmoyne soils, and of moderately deep, well-drained Trappist soils.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–7; woodland suitability group 9)

Jennings Series, Heavy Subsoil Variant

The Jennings series, heavy subsoil variant, consists of deep, well-drained soils on uplands. These gently sloping to strongly sloping soils occupy ridges and hillsides. They formed in thin loess over thin loam or clay loam glacial till and are underlain by material weathered from gray-green clay shale. These soils have a slowly permeable fragipan.

In a representative profile, the surface layer is brown, strongly acid silt loam about 5 inches thick. The subsoil is about 46 inches thick. The upper 20 inches is strong-brown, very strongly acid, friable silt loam and silty clay loam. The next 10 inches is a fragipan of strong-brown, very strongly acid, very firm and brittle silty clay loam that has pale-brown mottles. The lower part is dark yellowish-brown and olive-gray, strongly acid to very strongly acid, firm silty clay and clay. It has grayish-

brown and yellowish-brown mottles. The underlying material is soft, olive-gray clay shale that is strongly acid in the upper part and neutral below.

These soils have slow permeability and moderate available water capacity. Crops are subject to damage from drought during seasons that have below normal rainfall distribution. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow to rapid.

Representative profile of Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, eroded, in a wooded area where the slope is 10 percent and faces north, 800 feet south and 200 feet east of the northwest corner of the southeast quarter of sec. 33, T. 1 N., R. 6 E. in Clark County:

O1—2 inches to 1 inch, fresh hardwood leaves and twigs.

O2—1 inch to 0, partly decomposed leaves, twigs, and roots.

Ap—0 to 5 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable when moist; many small roots; strongly acid; abrupt, smooth boundary.

B1—5 to 9 inches, strong-brown (7.5YR 5/6) heavy silt loam; moderate, medium, subangular blocky structure; friable when moist; few small roots; very strongly acid; gradual, smooth boundary.

B21t—9 to 14 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; friable when moist; very strongly acid; gradual, smooth boundary.

B22t—14 to 25 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; friable when moist; thin discontinuous clay films on few peds; very strongly acid; gradual, smooth boundary.

Bx1t—25 to 35 inches, strong-brown (7.5YR 5/6) light silty clay loam; common, fine, distinct, pale-brown (10YR 6/3) mottles; moderate, coarse, subangular blocky structure; very firm and brittle when moist; thin, gray (10YR 5/1), discontinuous clay films on few peds; gray (10YR 6/1) silt coatings and cappings on tops of prisms and between prisms (range in thickness is from less than 1 millimeter to as much as 1 inch within the pedon); very strongly acid; gradual, smooth boundary.

IIB23t—35 to 43 inches, dark yellowish-brown (10YR 4/4) light silty clay; common, medium, distinct grayish-brown (10YR 5/2) mottles; weak, medium, angular and subangular blocky structure; firm when moist; thin discontinuous clay films on few peds; few glacial pebbles; very strongly acid; gradual, smooth boundary.

IIIB3—43 to 51 inches, olive-gray (5Y 5/2) clay; many, fine, prominent yellowish-brown (10YR 5/4) mottles; massive to weak, thick, platy structure; firm when moist; few small sandstone and shale pebbles; few small fragments from a large iron concretion; strongly acid; clear, smooth boundary.

C—51 to 60 inches, soft, olive-gray clay shale; strongly acid in upper part and neutral in lower part.

The solum ranges from about 35 to 55 inches in thickness. Depth to bedrock ranges from 40 to 60 inches. Depth to the fragipan ranges from about 18 to 30 inches. The fragipan ranges from about 6 to 20 inches in thickness. Depth to gray-green shale ranges from 4 to 6 feet. The B2 horizon ranges from silty clay loam to silty clay or clay and is dark yellowish brown (10YR 4/4) to strong brown (7.5YR 5/6) in the upper part and olive gray to light olive brown (2.5Y 5/4) near bedrock.

Soils of the Jennings series, heavy subsoil variant, are on slopes adjacent to the moderately deep, well-drained Rarden soils that lack a fragipan and have a redder subsoil. These soils are finer textured in the lower part of the subsoil and are more erodible than other Jennings soils and Cincinnati soils. Soils of the Jennings series, heavy subsoil variant, have drainage similar to that of other Jennings soils and of Cincinnati and Rarden soils.

Jennings silt loam, heavy subsoil variant, 2 to 6 percent slopes, eroded (JhB2).—This soil occupies narrow ridges and sloping hillsides. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 55 inches. Included in mapping were a few small areas of Jennings silt loam, heavy subsoil variant, that have a surface layer less than 3 inches thick and areas of soils that have a surface layer 9 to 11 inches thick. Also included were small areas of moderately deep, well-drained Rarden soils and deep, well-drained Zanesville soils.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–7; woodland suitability group 9)

Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, eroded (JhC2).—This soil occupies ridges and hillsides. The profile of this soil is the one described as representative for the series. Included in mapping were areas of soils that have a surface layer less than 3 inches thick. Also included were areas of soils that have a dark grayish-brown surface layer 9 to 11 inches thick, which are mostly in wooded areas. There are also small areas of moderately deep, well-drained Rarden soils and deep, well drained to moderately well drained Zanesville soils.

This soil is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe–7; woodland suitability group 9)

Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, severely eroded (JhC3).—This soil occupies ridges and hillsides. A few rills and small gullies are common. The profile of this soil is similar to that described as representative for the series, except that the surface layer is brown to strong brown and is less than 3 inches thick. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than that of the profile described as representative for the series. Included in mapping were a few small areas that have a surface layer 3 to 9 inches thick. Also included were small areas of moderately deep, well drained Rarden soils and deep, well drained to moderately well drained Zanesville soils.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–7; woodland suitability group 9)

Jennings silt loam, heavy subsoil variant, 12 to 18 percent slopes, eroded (JhD2).—This soil occupies hillside slopes that are smooth and nearly uniform. A few rills are common. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 45 inches and the fragipan is thinner and weaker. Included in mapping were small areas of soils that have a surface layer less than 3 inches thick. Also included were areas of soils that have a dark grayish-brown surface layer 9 to 11 inches thick, which are mostly in wooded areas. There are also small areas of moderately deep, well drained Rarden soils and deep, well drained to moderately well drained Zanesville soils.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–7; woodland suitability group 9)

Johnsburg Series

The Johnsburg series consists of deep, somewhat poorly drained soils on uplands. These are nearly level soils on broad ridges. They formed in loess, and the underlying material weathered from sandstone, siltstone, or shale. These soils have a very slowly permeable fragipan.

In a representative profile, the surface layer is about 7 inches of brown, strongly acid silt loam that has grayish-brown mottles. The subsoil is more than 55 inches thick and has yellowish-brown mottles. The upper 16 inches is light yellowish-brown to pale-brown, strongly acid to very strongly acid, friable silt loam. The next 22 inches is a fragipan of light brownish-gray, very strongly acid, very firm and brittle silt loam and silty clay loam. The lower part is light brownish-gray to gray, strongly acid, friable silty clay loam.

Johnsburg soils have very slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow.

Representative profile of Johnsburg silt loam, 0 to 2 percent slopes, in a cultivated field where the slope is 1 percent, 750 feet north and 625 feet east of the southwest corner of the NW¼ sec. 31, T. 1 N., R. 5 E., in Clark County:

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; few, fine, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, granular structure; friable when moist; many small roots; strongly acid; abrupt, smooth boundary.

B1—7 to 12 inches, light yellowish-brown (10YR 6/4) silt loam; many, fine, distinct, light brownish-gray (10YR 6/2), pale-brown (10YR 6/3), and yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable when moist; many small roots; strongly acid; clear, smooth boundary.

B2—12 to 23 inches, pale-brown (10YR 6/3) silt loam; many, fine, distinct, light brownish-gray (10YR 6/2), light yellowish-brown (10YR 6/4), and yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable when moist; few small roots; very strongly acid; clear, smooth boundary.

Bx1t—23 to 32 inches, light brownish-gray (10YR 6/2) silt loam; many, fine, distinct, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/6) mottles; moderate, coarse, prismatic structure breaking to moderate, coarse, angular and subangular blocky structure; very firm and brittle when moist; thin discontinuous clay films on few peds; few small sandstone and shale fragments; very strongly acid; clear boundary.

IIBx2t—32 to 40 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, fine, prominent, light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/6) mottles; moderate, coarse, prismatic structure (massive inside peds); very firm and brittle when moist; thin discontinuous clay films on few peds and in pores; few small sandstone and shale fragments; very strongly acid; clear, smooth boundary.

IIBx3—40 to 45 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, fine, prominent, light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/6) mottles; moderate, very coarse, prismatic structure (massive inside peds); very firm and brittle when moist; few small sandstone and shale fragments; very strongly acid; clear, smooth boundary.

IIB31—45 to 56 inches, light brownish-gray (10YR 6/2) silty clay loam; many, fine, distinct, brown (10YR 5/3) and yellowish-brown (10YR 5/6) mottles; massive, friable when moist; few sandstone and shale fragments; strongly acid; clear, smooth boundary.

IIB32—56 to 62 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable when moist; few small sandstone and shale fragments; strongly acid.

The solum ranges from 54 to 84 inches in thickness. Loess ranges from 24 to 48 inches in thickness. Depth to the fragipan ranges from 22 to 30 inches. Depth to bedrock ranges from 60 inches to more than 10 feet. The Ap horizon is dark grayish brown (10YR 4/2) to brown (10YR 5/3). The A horizon is strongly acid to neutral, depending on the amount of lime applied. Between the base of the A horizon and the top of the Bx horizon, the matrix is light brownish-gray (10YR 6/2) to light yellowish-brown (10YR 6/4) silt loam or silty clay loam. The Bx horizon has a matrix color of gray (10YR 6/1) to light brownish gray (2.5Y 6/2). Consistence is firm or very firm.

Johnsburg soils occupy areas adjacent to the well drained to moderately well drained Zanesville soils, which formed from similar materials. Johnsburg soils have less mottling in the upper part of the subsoil than the Zanesville soils.

Johnsburg silt loam, 0 to 2 percent slopes (JoA).—This soil is on broad ridges. The surface layer is brown and is 9 to 12 inches thick. Included in mapping were a few small areas of deep, moderately well drained Zanesville soils and of a deep, somewhat poorly drained soil that has a fragipan that formed in loess and material weathered from gray-green shale. Also included were areas of a deep, somewhat poorly drained soil that has a fragipan. This soil occupies terrace positions along the larger creeks in the western part of Clark and Floyd Counties.

This soil is moderately well suited to corn and soybeans. Runoff is slow and wetness is the main limitation. (Capability unit IIIw–3; woodland suitability group 5)

Lindside Series

The Lindside series consists of deep, moderately well drained soils on bottom lands that are subject to occasional flooding. These soils are nearly level and occupy long, narrow areas along the Ohio River. They formed in recent, neutral, micaceous alluvium of mixed origin in which limestone is a significant component.

In a representative profile, the surface layer is 15 inches thick. It is dark-brown, neutral silt loam in the upper 6 inches and dark-brown, neutral light silty clay loam in the lower part. The subsoil is 45 inches thick. It is dark-brown, neutral, friable, and has dark-gray mottles. The upper 12 inches is silty clay loam, and the lower part is silt loam.

Lindside soils have moderate permeability and high available water capacity. They are moderate in organic-matter content and high in natural fertility. The plow layer is dominantly neutral in areas not limed. Surface runoff is slow or very slow.

Representative profile of Lindside silt loam, in a cultivated field, 1,000 feet northeast of the southwest corner and 750 feet northeast of the west boundary of Clark Grant 5 in Clark County:

Ap—0 to 6 inches, dark-brown (10YR 3/3) silt loam (10YR 4/3 when rubbed); moderate, medium, granular structure; friable when moist; common mica flakes; neutral; abrupt, smooth boundary.

A12—6 to 15 inches, dark-brown (10YR 3/3) light silty clay loam (10YR 4/3 when rubbed); weak, coarse, prismatic structure breaking to moderate, medium, granular structure; friable when moist; dark-brown (10YR 3/3) organic coatings on many peds and in root channels; common mica flakes; common dark-brown (10YR 3/3) wormcasts; neutral; clear, smooth boundary.
B21—15 to 27 inches, dark-brown (10YR 4/3) light silty clay loam; few, fine, faint, yellowish-brown (10YR 5/6) and dark-gray (10YR 4/1) mottles; weak, coarse, prismatic structure breaking to weak, fine, granular structure; friable when moist; common mica flakes; dark grayish-brown (10YR 4/2) organic coatings on few peds; few, dark-brown (10YR 3/3) wormcasts; neutral; clear, smooth boundary.
B22—27 to 60 inches, dark-brown (10YR 4/3) heavy silt loam; common, medium, distinct dark-gray (10YR 4/1), dark grayish-brown (10YR 4/2), and yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; friable when moist; common mica flakes; discontinuous dark grayish-brown (10YR 4/2) organic coatings on few peds and in root channels; few black (10YR 2/1) manganese concretions; neutral.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock ranges from 60 inches to more than 10 feet. The Ap horizon is dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4). The B horizon has a matrix color of dark brown (10YR 4/3) to yellowish brown (10YR 5/4).

Lindside soils occupy areas adjacent to well-drained Huntington soils. Lindside soils have a subsoil that is grayer and more mottled than Huntington soils. They are darker colored and less acid than Wilbur soils, which have drainage similar to that of the Lindside soils.

Lindside silt loam (Ln).—This soil occupies long, narrow areas. Included in mapping were a few small areas that have a silty clay loam surface layer. Also included were small areas of deep, well-drained Huntington soils and deep, somewhat poorly drained Newark soils. There are also areas of a deep, moderately well drained soil that has a medium acid subsoil and a weak fragipan in places.

This soil is well suited to corn and soybeans. The main hazard is occasional flooding. Small grain and alfalfa are subject to severe damage during periods of prolonged flooding. (Capability unit I–2; woodland suitability group 8)

Markland Series

The Markland series consists of deep, well drained to moderately well drained soils. These sloping to steep soils are on breaks between higher lying terraces or uplands and lower lying terraces or bottom lands. They formed in loess and the underlying calcareous, fine-textured, stratified sediment deposited by slack water.

In a representative profile, the surface layer is about 2 inches of very dark gray, medium acid silt loam. The subsurface layer is about 5 inches of light yellowish-brown, medium acid silt loam. The subsoil is about 19 inches of olive-brown, neutral to mildly alkaline silty clay. The upper 5 inches of the subsoil is firm, and the lower part is very firm. The underlying material is light olive-brown, calcareous, firm silty clay to clay that has grayish-brown and light-gray mottles.

Markland soils have slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The plow layer is medium acid to neutral in areas not limed. Surface runoff is medium or rapid.

Representative profile of a Markland silt loam in a wooded area where the slope is 10 percent and faces southeast, 2,000 feet southeast of the northwest corner and 500 feet northeast of the west boundary of Clark Grant 46 in Clark County:

O1—½ inch to 0, fresh leaf litter.
A1—0 to 2 inches, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; friable when moist; many small roots; medium acid; abrupt, smooth boundary.
A2—2 to 7 inches, light yellowish-brown (10YR 6/4) silt loam; weak, coarse, granular structure; friable when moist; many small roots; medium acid; clear, smooth boundary.
B21t—7 to 12 inches, olive-brown (2.5Y 4/4) silty clay; strong, coarse, angular blocky structure; firm when moist; thin, discontinuous, brown (10YR 5/3) clay films on all peds; neutral to mildly alkaline in lower part; clear, wavy boundary.
B22t—12 to 26 inches, olive-brown (2.5Y 4/4) silty clay; strong, very coarse, angular blocky structure; very firm when moist; thin, discontinuous, brown (10YR 5/3) clay films on all peds; neutral to mildly alkaline; clear, wavy boundary.
C—26 to 60 inches, light olive-brown (2.5Y 5/4) silty clay to clay; few, fine, distinct, grayish-brown (10YR 5/2) mottles; massive; very firm when moist; thin light-gray (10YR 7/2) lime coatings in cracks; many soft and hard carbonate concretions; calcareous.

The solum ranges from 20 to 40 inches in thickness. Loess is dominantly less than 15 inches thick. Depth to bedrock ranges from 15 to 20 feet. The B horizon is neutral to mildly alkaline. Where there is an Ap horizon, it ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). The Ap horizon ranges from medium acid to neutral, depending on the amount of lime applied. The B2 horizon ranges from dark grayish-brown (2.5Y 4/2) to light olive-brown (2.5Y 5/4) silty clay or clay. The C horizon ranges from yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4). The C horizon has stratified layers of clay, silty clay, and silty clay loam, and there is some silt and fine sand in the lower layers.

Markland soils occupy areas adjacent to well drained and moderately well drained Uniontown soils. Markland soils have a thinner loess mantle, a more clayey subsoil, and are shallower to carbonates than Uniontown soils. They are less mottled in the upper part of the subsoil than nearby Henshaw soils.

Markland silt loam, 6 to 12 percent slopes, eroded (MaC2).—This soil occupies breaks between broad, higher lying soils on terraces and lower lying soils on terraces or bottom lands. The profile of this soil is similar to that described as representative for the series, except that the surface layer is light yellowish brown. Included in mapping were small areas that have a surface layer 8 to 10 inches thick. Also included were olive-brown Markland soils that have a silty clay loam surface layer that is less than 3 inches thick and Markland soils that have slopes of 2 to 6 percent.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–11; woodland suitability group 18)

Markland silt loam, 12 to 18 percent slopes, eroded (MaD2).—This soil occupies breaks between broad, higher lying soils on terraces and lower lying soils on terraces or bottom lands. The profile of this soil is similar to that described as representative for the series, except that the surface layer is light yellowish brown. Also, the combined thickness of the surface layer and subsoil is about 24 inches. Included in mapping were small areas of Mark-

land soils that have a surface layer 8 to 10 inches thick and areas of olive-brown Markland soils that have a silty clay loam surface layer that is less than 3 inches thick. Also included were small areas of deep, well-drained Uniontown soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 18)

Markland silt loam, 18 to 25 percent slopes, eroded (MaE2).—This soil occupies breaks between broad, higher lying soils on terraces and lower lying soils on terraces or bottom lands. The profile of this soil is similar to that described as representative for the series, except that the surface layer is light yellowish brown and carbonates are near the surface. Included in mapping were small areas of Markland soils that have a surface layer 8 to 10 inches thick and areas of olive-brown Markland soils that have a silty clay loam surface layer that is less than 3 inches thick. Also included were areas of Markland soils that have slopes steeper than 25 percent.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe-1; woodland suitability group 18)

Montgomery Series

The Montgomery series consists of deep, very poorly drained soils on terraces. These soils are nearly level and occupy broad depressional areas between higher lying soils on uplands and other soils on terraces. They formed in calcareous, fine-textured, stratified sediment deposited by slack water. These soils have a seasonally high water table.

In a representative profile, the surface layer is about 14 inches of very dark gray, neutral silty clay. The lower 4 inches has light olive-brown mottles. The subsoil, about 34 inches thick, is dark gray to gray and firm to extremely firm. The upper 28 inches is neutral silty clay that has olive-brown mottles. The lower part is neutral silty clay loam to silty clay that has yellowish-brown mottles. The underlying material is gray, calcareous, extremely firm silty clay loam to silty clay that has yellowish-brown mottles.

Montgomery soils have very slow permeability and high available water capacity. They are high in organic-matter content and natural fertility. The surface layer is slightly acid or neutral in areas not limed. Surface runoff is very slow or ponded.

Representative profile of Montgomery silty clay in a wooded area 1,250 feet north of the southwest corner and 625 feet northeast of the west boundary of Clark Grant 46 in Clark County:

A11—0 to 10 inches, very dark gray (10YR 3/1) silty clay; strong, medium, granular structure; friable when moist, sticky when wet; many small roots; neutral; clear, smooth boundary.

A12—10 to 14 inches, very dark gray (N 3/0) silty clay; few, fine, distinct, light olive-brown (2.5Y 5/4) mottles; weak, medium, prismatic structure breaking to moderate, medium, angular and subangular blocky structure; firm when moist, sticky when wet; few small roots; thin discontinuous clay films on few pressure faces and in root channels; neutral; clear, wavy boundary.

B21g—14 to 19 inches, dark-gray (5Y 4/1) silty clay; common, fine, distinct, olive-brown (2.5Y 4/4) mottles; weak, medium, prismatic structure breaking to moderate, medium, subangular and angular blocky structure; firm when moist, sticky when wet; few small roots; few clay films in root channels; black (N 2/0) decomposed organic matter in large root channels; neutral; few iron and manganese concretions; clear, wavy boundary.

B22g—19 to 29 inches, dark-gray (5Y 4/1) silty clay; many fine, distinct, light olive-brown (2.5Y 5/6) mottles; moderate, medium, prismatic structure breaking to moderate, medium, subangular and angular blocky structure; very firm when moist, sticky when wet; few small roots; thin discontinuous clay films on few peds; neutral; clear, wavy boundary.

B23g—29 to 42 inches, gray (5Y 5/1) silty clay; many, fine, distinct, light olive-brown (2.5Y 5/6) mottles; strong, medium, prismatic structure breaking to moderate, medium, subangular and angular blocky structure; extremely firm when moist, sticky when wet; few small roots; thin discontinuous clay films on few peds; few iron and manganese concretions; neutral; clear, wavy boundary.

B24g—42 to 48 inches, dark-gray (5Y 4/1) silty clay loam to silty clay; many, fine, prominent, yellowish-brown (10YR 5/6) mottles; strong, medium, prismatic structure breaking to moderate, medium, subangular and angular blocky structure; extremely firm when moist, sticky when wet; thin discontinuous clay films on few peds; few iron and manganese concretions; neutral; clear, wavy boundary.

C—48 to 76 inches, gray (5Y 5/1) silty clay loam to silty clay; many, fine, prominent, yellowish-brown (10YR 5/6) mottles; massive; extremely firm when moist, sticky when wet; few iron and manganese concretions; calcareous.

The solum ranges from 30 to 55 inches in thickness. It is slightly acid to neutral. Depth to bedrock ranges from 15 to 20 feet. The A1 horizon has a matrix color of very dark gray (N 3/0) to very dark grayish brown (10YR 3/2). The A1 horizon is dominantly silty clay but ranges to silty clay loam. In undisturbed areas the A1 horizon ranges from 10 to 15 inches in thickness. The Bg horizon has a matrix color of dark gray (2.5Y 4/1) to gray (5Y 5/1) and ranges from silty clay loam to clay. The C horizon ranges from dark gray (5Y 4/1) to gray (N 5/0). There are many mottles, mostly 2.5Y or 10YR in hue. The C horizon has stratified layers of clay, silty clay, and silty clay loam, and there is some silty material in the lower layers. Clay films in the profile may be a result of the movement of water in cracks rather than of illuviation.

Montgomery soils occupy areas adjacent to the very poorly drained Zipp soils. They have a thicker surface layer than the Zipp soils.

Montgomery silty clay (Mo).—This soil occupies depressions and broad depressional flats. Included with this soil in mapping were a few small areas of Montgomery and Zipp soils that have a silty clay loam surface layer. Also included were small areas of a deep, very poorly drained soil that has a silt loam and silty clay loam subsoil.

This soil is moderately well suited to corn and soybeans. Runoff is very slow or ponded, and wetness is the main limitation. This soil is difficult to work. It becomes cloddy if tilled when it is too wet or too dry, and at these times a seedbed is difficult to prepare. (Capability unit IIIw-2; woodland suitability group 11)

Newark Series

The Newark series consists of deep, somewhat poorly drained soils on bottom lands that are subject to occasional flooding. These soils occupy long, narrow, depressional sloughs and waterways along the Ohio River. They formed in recent, neutral, micaceous alluvium of mixed origin in which limestone is a significant component.

In a representative profile, the surface layer is about 5 inches of very dark grayish-brown, neutral silt loam. The subsoil is about 55 inches of neutral, friable silt loam. The upper 5 inches is dark grayish brown and has yellowish-brown mottles. The next 32 inches is dark grayish brown and has yellowish-brown mottles. The lower part is yellowish brown and has gray mottles. The underlying material is yellowish-brown, neutral to slightly alkaline, friable loam that has gray and grayish-brown mottles.

Newark soils have moderate permeability and high available water capacity. They are moderate in organic-matter content and high in natural fertility. The plow layer is dominantly neutral in areas not limed. Surface runoff is very slow or ponded.

Representative profile of Newark silt loam in a wooded area 500 feet northeast of the southwest corner and 375 feet northeast of the west boundary of Clark Grant 3 in Clark County:

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, coarse, granular structure; friable when moist; common mica flakes; neutral; clear, wavy boundary.

B21—5 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, granular structure; friable when moist; common mica flakes; neutral; clear, wavy boundary.

B22—10 to 32 inches, dark grayish-brown (10YR 4/2) silt loam; few, medium, faint, dark-brown (10YR 4/3) mottles and many, medium, distinct, yellowish-brown (10YR 5/6 and 10YR 5/8) mottles; weak, coarse, subangular blocky structure; friable when moist; common mica flakes; few iron and manganese concretions; neutral; gradual, irregular boundary.

B23—32 to 42 inches, dark grayish-brown (10YR 4/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6 and 10YR 5/8) mottles; weak, coarse, subangular blocky structure; friable when moist; discontinuous dark-gray (10YR 4/1) organic coatings on few peds; common mica flakes; common black (10YR 2/1) iron and manganese concretions; neutral; clear, wavy boundary.

B24—42 to 60 inches, yellowish-brown (10YR 5/8) silt loam; common, medium, distinct, dark-gray (10YR 4/1) mottles; weak, very coarse, subangular blocky structure; friable when moist; common mica flakes; common black (10YR 2/1) iron and manganese concretions; neutral; clear, wavy boundary.

C—60 to 70 inches, yellowish-brown (10YR 5/6) loam; common, medium, distinct, gray (10YR 5/1) and grayish-brown (10YR 5/2) mottles; massive; friable when moist; neutral to slightly alkaline.

The solum ranges from 36 to 60 inches. Depth to bedrock ranges from 60 inches to more than 10 feet. The A horizon ranges from very dark grayish-brown (10YR 3/2) to dark grayish-brown (10YR 4/2) silt loam or silty clay loam. The B horizon has a matrix color of very dark grayish brown (10YR 3/2) to grayish brown (10YR 5/2) and is silt loam or silty clay loam.

Newark soils occupy areas adjacent to moderately well drained Lindside soils. They have more mottling in the upper part of the subsoil than the Lindside soils. They have drainage similar to that of Wakeland soils but are less acid.

Newark silt loam (Ne).—This soil occupies long, narrow, depressional sloughs and waterways. Included in mapping were a few small areas of deep, moderately well drained Lindside soils and a few small areas of deep, poorly drained soils on bottom lands. Also included were areas of a deep, moderately well drained soil that has a medium acid subsoil and a weak fragipan in places.

This soil is well suited to corn and soybeans. The main hazard is occasional flooding, and the main limitation is wetness. Small grain and alfalfa are subject to severe damage during prolonged periods of flooding. (Capability unit IIw-7; woodland suitability group 13)

Pekin Series

The Pekin series consists of deep, moderately well drained soils on terraces. These soils are along most of the larger streams in the area. These gently sloping soils are on short breaks between higher, nearly level soils on terraces and lower lying soils on terraces or bottom lands. They formed in stratified silty material. These soils have a slowly permeable fragipan.

In a representative profile, the surface layer is about 10 inches of dark grayish-brown, neutral silt loam. The subsoil is about 53 inches thick and has light brownish-gray and yellowish-brown mottles. The upper 15 inches is light yellowish-brown, slightly acid to strongly acid, friable to firm silt loam. The lower part is a fragipan of yellowish-brown, strongly acid, very firm and brittle silty clay loam. The underlying material is yellowish-brown, slightly acid, silty material.

Pekin soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is medium.

Representative profile of Pekin silt loam, 2 to 6 percent slopes, eroded, in a cultivated field where the slope is 4 percent and faces southeast, 2,250 feet northwest of the southeast corner and 1,000 feet southwest of the east boundary of Clark Grant 236 in Clark County:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

B1—10 to 18 inches, light yellowish-brown (10YR 6/4) silt loam; few, fine, faint, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable when moist; few small till pebbles; slightly acid; clear, wavy boundary.

B2—18 to 25 inches, light yellowish-brown (10YR 6/4) heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8) mottles; moderate, medium, subangular blocky structure; firm when moist; many till pebbles and manganese and iron concretions; strongly acid; clear, wavy boundary.

Bx1t—25 to 39 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8) mottles; strong, coarse, prismatic structure breaking to moderate, coarse, subangular blocky structure; very firm and brittle when moist; thin discontinuous grayish-brown (10YR 5/2) clay films on few peds; few iron and manganese concretions; strongly acid; gradual, irregular boundary.

Bx2t—39 to 63 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8) mottles; strong, very coarse, prismatic structure breaking to strong, coarse, subangular blocky structure; very firm and brittle when moist; thin discontinuous grayish-brown (10YR 5/2) clay films on many peds; common iron and manganese concretions; strongly acid; clear, wavy boundary.

C—63 to 70 inches, yellowish-brown (10YR 5/8), platy silty material; slightly acid.

The solum ranges from 54 to 72 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches. Depth to bed-

rock ranges from 72 inches to more than 10 feet. The solum below the Ap horizon is strongly acid or very strongly acid. The Ap horizon is dominantly dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). It is strongly acid to neutral, depending on the amount of lime applied. Between the base of the A horizon and the top of the Bx horizon, the matrix has a color of brown (10YR 5/3) to light yellowish brown (10YR 6/4) and is silt loam or silty clay loam. The Bx horizon has a matrix color of brown (10YR 5/3) to yellowish brown (10YR 5/6) and is silt loam or silty clay loam. The C horizon is stratified silt loam and silty clay loam.

Pekin soils occupy areas adjacent to somewhat poorly drained Bartle soils. They are more mottled in the upper part of the subsoil than the Bartle soils. Pekin soils have drainage similar to that of Wilbur soils, but they have a fragipan and a more acid subsoil.

Pekin silt loam, 2 to 6 percent slopes, eroded (PeB2).—This soil occupies narrow terraces between higher lying, nearly level soils on terraces and lower lying soils on terraces and bottom lands. The surface layer is brown and is 3 to 9 inches thick. Included in mapping were a few small areas of Pekin soils that have a surface layer 9 to 12 inches thick and of Pekin soils that have a surface layer less than 3 inches thick. Also included were areas of deep, somewhat poorly drained Bartle soils.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–7; woodland suitability group 9)

Pits

Pits (Ps) consists of limestone, sandstone, and shale quarries and pits that are located throughout the area. Some of these are on terraces along the Ohio River, where sand and gravel are excavated. Other pits are in upland areas, where soil material is excavated for roads, highways, fill material for building foundations, and other uses. Some of the limestone quarried is crushed fine for farm use. Limestone, sandstone, and shale are also used in industry. The pits are of various shapes and depths.

A few willows and shrubs grow in the crevices at the bottoms of the quarries and pits, and these provide habitat for wildlife. Some abandoned quarries and pits are suitable for stocking with fish and developing for wildlife habitat. (Capability unit VIIe–3; woodland suitability group 16)

Pope Series

The Pope series consists of moderately deep, well-drained soils on bottom lands that are subject to seasonal flooding. These soils are nearly level and occupy long, narrow areas adjacent to stream channels. They formed in recent mixed alluvium that is neutral to strongly acid.

In a representative profile, the surface layer is about 8 inches of dark-brown, slightly acid silt loam. The subsoil is 28 inches thick and is dark brown. The upper 14 inches is slightly acid, friable silt loam. The lower part is strongly acid, very friable gravelly loam. Below this is loose gravel.

Pope soils have moderate permeability and low available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is medium or slightly acid in areas not limed. Surface runoff is slow or medium.

Representative profile of Pope silt loam in a cultivated field where the slope is 1 percent, 500 feet south and 50 feet west of the northeast corner of the SE¼ sec. 32 T. 1 N., R. 5 E. in Clark County:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable when moist; many small roots; slightly acid; clear, smooth boundary.

B21—8 to 22 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable when moist; few small roots; few sandstone and shale pebbles; slightly acid; clear, smooth boundary.

B22—22 to 36 inches, dark-brown (10YR 4/3) gravelly loam; weak, fine and medium, granular structure; very friable when moist; strongly acid.

C—36 inches, loose gravel.

The solum ranges from 30 to 50 inches in thickness. Depth to bedrock ranges from 3 to 6 feet. The Ap horizon ranges from dark-brown (10YR 4/3) to brown (10YR 5/3) silt loam or gravelly silt loam and is medium acid or slightly acid. The B horizon is dark-brown (10YR 4/3) or brown (10YR 5/3) silt loam or loam.

Pope soils occupy areas adjacent to moderately well drained Wilbur soils. They have a subsoil that is coarser, more acid, and less mottled than that of Wilbur soils. Pope soils have drainage similar to that of Haymond soils, but they have a thinner solum and the subsoil is coarser textured and more acid.

Pope silt loam (Pt).—This soil occupies long, narrow areas adjacent to stream channels and on alluvial fans. Included in mapping were small areas of deep, well drained Haymond soils and deep, moderately well drained Wilbur soils. In some places there are gravelly spots. The more prominent ones are shown on the map by spot symbols.

This soil is well suited to corn and soybeans. The main hazard is the seasonal flooding that occurs between December and June. The main limitation is droughtiness that occurs in summer and fall because of low available water capacity. (Capability unit IIs–1; woodland suitability group 8)

Rarden Series

The Rarden series consists of moderately deep, well-drained soils on uplands. These sloping and strongly sloping soils are on ridges and hillsides. They formed in thin loess and are underlain by material weathered from gray-green shale bedrock.

In a representative profile, the surface layer is about 4 inches of brown, very strongly acid silt loam. The subsoil is about 22 inches thick. It is strong brown to yellowish red and very strongly acid. The upper 10 inches is friable silt loam and silty clay loam. The lower part is firm silty clay and clay that has olive and olive-gray mottles. The underlying material is olive-gray, strongly acid, very firm clay that has yellowish-brown mottles.

Rarden soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is medium or rapid.

Representative profile of Rarden silt loam, 6 to 12 percent slopes, eroded, in a wooded area where the slope is

10 percent and faces west, 1,750 feet southeast of the northwest corner and 1,000 feet northeast of the west boundary of Clark Grant 233 in Clark County:

O1—2 inches to 1 inch, fresh hardwood and pine leaves and twigs.

O2—1 inch to 0, partly decomposed leaves and twigs.

Ap—0 to 4 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable when moist; many small roots; very strongly acid; clear, smooth boundary.

B1—4 to 9 inches, strong-brown (7.5YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable when moist; many small roots and few roots ½ inch in diameter; very strongly acid; clear, smooth boundary.

B21t—9 to 14 inches, yellowish-red (5YR 4/6) silty clay loam; few, fine, prominent, olive (5Y 5/3) mottles; moderate, medium, angular and subangular blocky structure; friable when moist; few small roots and few roots ½ inch in diameter; thin, nearly continuous, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) clay films on many horizontal and vertical peds; very strongly acid; clear, smooth boundary.

IIB22t—14 to 19 inches, strong-brown (7.5YR 5/6) silty clay; many, fine, prominent, olive (5Y 5/3) mottles and few, fine, distinct yellowish-red (5YR 4/6) mottles; moderate, medium, angular and subangular blocky structure; firm when moist; few small roots and few roots ½ inch in diameter; thin, nearly continuous, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4) clay films on few vertical peds; very strongly acid; clear, smooth boundary.

IIB3t—19 to 26 inches, yellowish-red (5YR 4/6) clay; many, medium, prominent, yellowish-brown (10YR 5/4) and olive-gray (5Y 5/2) mottles; weak, medium, angular and subangular blocky structure; firm when moist; few small roots and few roots ½ inch in diameter; thin, discontinuous, yellowish-brown (10YR 5/6 and 10YR 5/4) clay films on few vertical peds; few red stones 4 inches in length; very strongly acid; clear, smooth boundary.

IIC1—26 to 34 inches, olive-gray (5Y 5/2) clay; many, fine, prominent-yellowish-brown (10YR 5/4) mottles; massive; very firm when moist; few small roots; few red stones 4 inches in length; strongly acid; clear, smooth boundary.

IIC2—34 to 50 inches, soft olive-gray clay shale; few brown shale fragments; strongly acid.

IIC3—50 to 60 inches, soft olive-gray clay shale; few brown shale fragments; medium acid; neutral reaction below 57 inches.

The solum ranges from 20 to 35 inches in thickness. Loess is less than 18 inches thick. Depth to gray-green shale ranges from 25 to 40 inches. The Ap horizon ranges from dark brown (10YR 3/3) to yellowish brown (10YR 5/4). The Ap horizon is strongly acid or very strongly acid in areas not limed. The B2 horizon has a matrix color of olive brown (2.5Y 4/4) to yellowish brown (10YR 5/6). The lower part of the horizon has mottles that have hues of 5Y to 10YR, including olive (5Y 5/3) and yellowish brown (10YR 5/4). Consistence is friable to very firm. The C horizon is silty clay or clay.

Rarden soils occupy areas adjacent to excessively drained Rockcastle soils. They have a redder and thicker solum than Rockcastle soils. Rarden soils have drainage and depth similar to those of Gilpin and Trappist soils, but they have a more clayey subsoil and are more erodible.

Rarden silt loam, 6 to 12 percent slopes, eroded (RdC2).—This soil occupies narrow ridges and hillsides. The profile of this soil is the one described as representative for the series. Included in mapping were small areas of Rarden soils that have a surface layer 7 to 9 inches thick and of Rarden soils that have a surface layer less than 3 inches thick. Also included were small areas of deep, well-drained Jennings soils.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe-8; woodland suitability group 22)

Rarden silt loam, 12 to 18 percent slopes, eroded (RdD2).—This soil occupies narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the loess mantle is about 12 inches thick and the combined thickness of the surface layer and the subsoil is about 24 inches. Included in mapping were small areas of deep, well-drained Jennings soils and moderately deep, excessively drained Rockcastle soils. Also included were a few small areas of Rarden soils that have a surface layer less than 3 inches thick.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 22)

Rarden silty clay loam, 6 to 12 percent slopes, severely eroded (ReC3).—This soil occupies narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is strong brown and is less than 3 inches thick. Also, it is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were small areas of Rarden soils that have a surface layer 3 to 7 inches thick. Also included were small areas of deep, well-drained Jennings soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are hazards in use and management. (Capability unit VIe-1; woodland suitability group 22)

Rarden silty clay loam, 12 to 18 percent slopes, severely eroded (ReD3).—This soil occupies narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is strong brown and is less than 3 inches thick. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. The loess mantle is about 10 inches thick, and the solum is about 22 inches thick. Included in mapping were small areas of deep, well-drained Jennings soils and moderately deep, excessively drained Rockcastle soils. Also included were a few small areas of Rarden soils that have a surface layer 3 to 7 inches thick.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe-1; woodland suitability group 22)

Rockcastle Series

The Rockcastle series consists of moderately deep, excessively drained soils on uplands. These are steep to extremely steep soils on hillsides. They formed in material weathered from gray-green shale bedrock.

In a representative profile, the surface layer is about 4 inches of light olive-brown, very strongly acid silt loam. The subsoil is about 13 inches thick, strongly acid, and friable. The upper 6 inches is yellowish-brown silty clay loam that has light olive-brown mottles. The lower part is light olive-brown silty clay loam that has olive-gray mottles. The underlying material is olive, strongly acid,

firm silty clay overlying olive-gray, medium acid clay shale.

Rockcastle soils have slow permeability and low available water capacity. They are low in organic-matter content and natural fertility. The surface layer is dominantly strongly acid in areas not limed. Surface runoff is very rapid.

Representative profile of Rockcastle silt loam, 18 to 55 percent slopes, in a wooded area where the slope is 40 percent and faces northwest, 2,500 feet southeast of the northwest corner and 1,600 feet northeast of the west boundary of Clark Grant 233 in Clark County:

O1—2 inches to 1 inch, fresh hardwood leaves and twigs.
O2—1 inch to 0, partly decomposed leaves, twigs, and roots.
Ap—0 to 4 inches, light olive-brown (2.5Y 5/4) silt loam; moderate, medium, granular structure; friable when moist; many small roots; very strongly acid; clear, smooth boundary.
B21—4 to 10 inches, yellowish-brown (10YR 5/4) silty clay loam; weak, medium, angular and subangular blocky structure; friable when moist; many small roots; light olive-brown (2.5Y 5/4) silt films on many peds; strongly acid; clear, smooth boundary.
B22—10 to 17 inches, light olive-brown (2.5Y 5/4) silty clay loam; few, medium, distinct, olive-gray (5Y 5/2) mottles; weak, medium, angular and subangular blocky structure; friable when moist; many small roots; few red stones 4 inches long; strongly acid; clear, smooth boundary.
C1—17 to 26 inches, olive (5Y 5/3) silty clay; massive; firm when moist; few small roots; few red stones 4 inches long; strongly acid; clear, smooth boundary.
C2—26 inches, olive-gray (5Y 4/2) clay shale; medium acid.

The solum ranges from 10 to 20 inches in thickness. Depth to shale ranges from 15 to 30 inches. The Ap horizon ranges from light yellowish-brown (10YR 6/4) to dark grayish-brown (2.5Y 4/2) silt loam or silty clay loam. The B2 horizon ranges from light olive brown (2.5Y 5/4) to olive gray (5Y 5/2). The C horizon is silty clay or clay. It is massive or has a platy structure. Consistence is firm or very firm.

Rockcastle soils formed from similar materials and occupy slopes adjacent to well-drained Rarden soils. They have a yellower and thinner solum than Rarden soils. Rockcastle soils have drainage similar to that of Berks, Colyer, and Weikert soils. They have a yellower, less acid subsoil than the Colyer soils. Rockcastle soils have a more clayey and less acid subsoil than Berks and Weikert soils.

Rockcastle silt loam, 18 to 55 percent slopes (RkF).—This soil is on hillsides. In some places there are outcrops of gray-green shale bedrock. Included in mapping were small areas of yellowish-brown Rockcastle soils that have a silty clay surface layer less than 2 inches thick. Most areas of these soils are in places where woods have been cleared for pasture. Also included were small areas of moderately deep, well-drained Rarden soils.

This soil is suited to trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe-2; woodland suitability group 22)

Rossmoyne Series

The Rossmoyne series consists of deep, moderately well drained soils on uplands. These soils are nearly level where they occur on narrow ridges, and they are gently sloping where they occur on short breaks between ridges and hillsides. They formed in thin loess and the underlying loam or clay loam glacial till. Below the till is limestone or shale bedrock. These soils have a slowly permeable fragipan.

In a representative profile, the surface layer is about 8 inches of dark-brown, strongly acid silt loam. The subsurface layer is about 4 inches of light yellowish-brown to gray, strongly acid silt loam. The subsoil is about 74 inches thick and has yellowish-brown mottles. The upper 12 inches is pale-brown, very strongly acid, friable silt loam. The next 34 inches is a fragipan of light brownish-gray, very strongly acid, very firm and brittle silt loam. The lower part is gray, medium to slightly acid, friable loam to clay loam. The underlying material is gray, slightly acid, friable silt loam to clay loam that has yellowish-brown mottles.

Rossmoyne soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow or medium.

Representative profile of Rossmoyne silt loam, 2 to 6 percent slopes, eroded, in a cultivated field where the slope is 5 percent and faces south, 2,375 feet southeast of the northwest corner and 500 feet northeast of the west boundary of Clark Grant 229 in Clark County:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable when moist; strongly acid; abrupt, smooth boundary.
A2—8 to 12 inches, light yellowish-brown (10YR 6/4) silt loam; moderate, medium, platy structure; friable when moist; strongly acid; clear, smooth boundary.
B1—12 to 24 inches, pale-brown (10YR 6/3) silt loam; common, fine, faint, yellowish-brown (10YR 5/4) and light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable when moist; vesicular; thin gray (10YR 6/1) silt films on few peds; very strongly acid; gradual, wavy boundary.
IIBx1—24 to 32 inches, light brownish-gray (10YR 6/2) heavy silt loam; common, medium, distinct, brownish-yellow (10YR 6/6) and yellowish-brown (10YR 5/6) mottles; moderate, coarse, prismatic structure; very firm and brittle when moist; thin gray (10YR 6/1) silt films on prismatic peds; vesicular; few till pebbles; very strongly acid; abrupt, irregular boundary.
IIBx2t—32 to 58 inches, gray (10YR 5/1) heavy silt loam; many, coarse, distinct, yellowish-brown (10YR 5/8) mottles; strong, very coarse, prismatic structure (massive inside peds); very firm and brittle when moist; thick, discontinuous, gray (10YR 5/1) clay films on all peds; thick clay films on all peds; thick clay films on sides of crayfish, worm, and root channels; 5 to 10 percent, by volume, of horizon consists of clay films; few till pebbles; very strongly acid; gradual, irregular boundary.
IIB3t—58 to 86 inches, gray (10YR 5/1) loam to light clay loam; many, coarse, distinct, yellowish-brown (10YR 5/8) and brownish-yellow (10YR 6/8) mottles; moderate, coarse, prismatic structure (massive inside peds) in upper part of horizon; massive in lower part of horizon; friable when moist; thick, discontinuous, gray (10YR 6/1) clay films on peds and on walls of crayfish holes and root channels; 5 to 10 percent, by volume, of horizon consists of clay films; many till pebbles; common, soft, black and brown iron and manganese concretions; medium to slightly acid; diffuse, wavy boundary.
IIC—86 to 96 inches, gray (10YR 6/1) silt loam to light clay loam; many, coarse, distinct, yellowish-brown (10YR 5/8) and light yellowish-brown (10YR 6/4) mottles; massive; friable when moist; slightly acid in upper part and neutral in lower part.

The solum ranges from 72 to 90 inches in thickness. Loess ranges from 20 to 50 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches. Depth to limestone or shale bedrock ranges from 72 inches to more than 10 feet.

The Ap horizon is dark yellowish brown (10YR 4/2) to light yellowish brown (10YR 6/4). It is strongly acid to neutral, depending on the amount of lime applied. Between the base of the A horizon and the top of the Bx horizon, the matrix is brown (10YR 5/3) to light yellowish-brown (10YR 6/4). Texture is silt loam or light silty clay loam, and reaction is medium acid to very strongly acid. The Bx horizon has a matrix color of gray (10YR 5/1) to brownish yellow (10YR 6/6). It is silt loam or silty clay loam and is strongly acid or very strongly acid.

Rossmoyne soils formed in similar materials and occupy slopes adjacent to Avonburg and Cincinnati soils. Rossmoyne soils have less gray mottling in the upper part of the subsoil than somewhat poorly drained Avonburg soils and more gray mottling than the well-drained Cincinnati soils.

Rossmoyne silt loam, 0 to 2 percent slopes (RoA).—This soil occupies narrow ridges and knolls. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark grayish brown and is 9 to 12 inches thick. Thickness of loess and depth to the fragipan are about 28 inches. Included in mapping were a few small areas of deep, somewhat poorly drained Avonburg soils. Where this Rossmoyne soil is in karsted areas, small areas of deep, well-drained Cincinnati and Grayford soils were included. Also included were small areas of deep, well-drained Jennings soils.

This soil is well suited to corn, soybeans, and small grain. Runoff is slow, and wetness is the main limitation. (Capability unit IIw–5; woodland suitability group 9)

Rossmoyne silt loam, 2 to 6 percent slopes, eroded (RoB2).—This soil (fig. 6) occupies narrow ridges and short breaks between nearly level soils on ridges and sloping soils on hillsides. It has the profile described as representative for the series. Included in mapping were a few small areas of Rossmoyne soils that have a surface layer 9 to 12 inches thick and some that have a surface layer 3 inches thick. Also included were some areas of deep, well-drained Cincinnati and Grayford soils and small areas of deep, well-drained Jennings soils.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–7; woodland suitability group 9)

Rossmoyne silt loam, 2 to 6 percent slopes, severely eroded (RoB3).—This soil occupies narrow ridges and short breaks between nearly level soils on ridges and sloping soils on hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is light yellowish brown and is less than 3 inches thick. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and

Figure 6.—Black Angus cattle grazing on tall fescue pasture on Rossmoyne silt loam, 2 to 6 percent slopes, eroded.

more difficult to keep in good tilth than the original surface layer. Included in mapping were a few small areas of Rossmoyne soils that have a surface layer 3 to 9 inches thick and a few small areas of deep, well-drained Cincinnati and Grayford soils. Also included were small areas of deep, well-drained Jennings soils.

This soil is moderately well suited to corn, soybeans, and small grain.

Erosion and runoff are the main hazards in use and management. (Capability unit IIIe-7; woodland suitability group 9)

Trappist Series

The Trappist series consists of moderately deep, well-drained soils on uplands. These sloping and strongly sloping soils are on ridges and hillsides. They formed in thin loess and are underlain by material weathered from black shale bedrock.

In a representative profile, the surface layer is about 7 inches of dark yellowish-brown, very strongly acid silt loam. The subsoil, about 27 inches thick, is strong brown and very strongly acid. The upper 15 inches is friable silt loam and silty clay loam. The lower part is firm silty clay. The underlying material is reddish-brown, very strongly acid, firm clay that has yellowish-brown, red, and grayish-brown mottles. It overlies black shale bedrock.

Trappist soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is medium or rapid.

Representative profile of a Trappist silt loam, in a wooded area where the slope is 14 percent and faces east, 2,000 feet southwest of the northeast corner and 100 feet southeast of the north boundary of Clark Grant 156 in Clark County:

O1—2½ inches to 1 inch, fresh hardwood leaves and twigs.

O2—1 inch to 0, partly decomposed leaves, roots, and twigs.

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, medium, granular structure; friable when moist; many small roots; very strongly acid; clear, smooth boundary.

B1—7 to 15 inches, strong-brown (7.5YR 5/6) silt loam; weak, medium, subangular blocky structure; friable when moist; few small and medium roots; very strongly acid; clear, smooth boundary.

B21t—15 to 22 inches, strong-brown (7.5YR 5/6) heavy silty clay loam; moderate and strong, medium, subangular blocky structure; friable when moist; few small roots; thin, discontinuous, yellowish-red (5 YR 4/6) clay films on many peds; very strongly acid; clear, smooth boundary.

IIB22t—22 to 28 inches, strong-brown (7.5YR 5/6) light silty clay; strong, medium, angular blocky structure; firm when moist; few small roots; thin, discontinuous, yellowish-red (5YR 4/6) clay films on few peds; thin, discontinuous, yellowish-brown (10YR 5/6) silt films on many peds; very strongly acid; clear, smooth boundary.

IIB3t—28 to 34 inches, strong-brown (7.5YR 5/6) silty clay; moderate, medium, angular and subangular blocky structure; firm when moist; few small roots; thin, discontinuous, yellowish-red (5YR 4/6) clay films on few peds; thin, discontinuous, yellowish-brown (10YR 5/6) silt films on many peds; very strongly acid; clear, smooth boundary.

IIC—34 to 39 inches, reddish-brown (5YR 4/4) clay; many, fine, prominent, yellowish-brown (10YR 5/4), red (2.5YR 4/6), and grayish-brown (2.5Y 5/2) mottles; massive; firm when moist; many small shale fragments; very strongly acid; clear, smooth boundary.

IIR—39 inches, black shale bedrock.

The solum ranges from 20 to 40 inches in thickness. Loess ranges from 15 to 30 inches in thickness. Depth to bedrock ranges from 30 to 50 inches. The solum below the Ap horizon is dominantly strongly acid or very strongly acid. The Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark yellowish brown (10YR 4/4). It is strongly acid to very strongly acid where the soil is not limed. The B2 horizon has a matrix color of olive brown (2.5Y 4/4) to yellowish brown (10YR 5/6). It is silt loam or silty clay loam in the upper part and silty clay or clay in the lower part. The C horizon is silty clay or clay.

Trappist soils formed in similar materials and occupy areas adjacent to excessively drained Colyer soils. They have a thicker combined surface layer and subsoil and are deeper to black shale bedrock than Colyer soils. Trappist soils have similar drainage but a thinner combined surface layer and subsoil than Cincinnati and Jennings soils. They also lack a fragipan and have a more clayey subsoil than these soils. Trappist soils have drainage similar to that of Rarden soils but are less clayey in the subsoil.

Trappist silt loam, 6 to 12 percent slopes, eroded (TrC2).—This soil occupies narrow ridges and hillsides. Included in mapping were small areas of Trappist soils that have a surface layer 8 to 11 inches thick and small areas that have a surface layer less than 3 inches thick. Also included were small areas of deep, well-drained Cincinnati and Jennings soils.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe-8; woodland suitability group 10)

Trappist silt loam, 6 to 12 percent slopes, severely eroded (TrC3).—This soil is on narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except the surface layer is yellowish brown and is less than 3 inches thick. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. The combined thickness of the surface layer and subsoil is about 25 inches, and depth to bedrock is about 35 inches. Included in mapping were small areas of Trappist soils that have a surface layer 3 to 8 inches thick. Also included were small areas of deep, well-drained Cincinnati and Jennings soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 10)

Trappist silt loam, 12 to 18 percent slopes, eroded (TrD2).—This soil is on narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 25 inches and depth to bedrock is about 35 inches. Included in mapping were areas of Trappist soils that have a surface layer less than 3 inches thick. Also included were small areas of deep, well-drained Cincinnati and Jennings soils and shallow, excessively drained Colyer soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and man-

agement. (Capability unit VIe–1; woodland suitability group 10)

Trappist silt loam, 12 to 18 percent slopes, severely eroded (TrD3).—This soil occupies narrow ridges and hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is yellowish brown and less than 3 inches thick. Also, the surface layer is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. The combined thickness of the surface layer and subsoil is about 22 inches, and depth to bedrock is about 32 inches. Included in mapping were small areas of deep, well-drained Cincinnati and Jennings soils and shallow, excessively drained Colyer soils. Also included were a few small areas of Trappist soils that have a surface layer 3 to 8 inches thick.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe–1; woodland suitability group 10)

Uniontown Series

The Uniontown series consists of deep, well drained to moderately well drained soils on terraces. These gently sloping and sloping soils occupy breaks between higher lying soils on terraces and lower lying soils on terraces or bottom lands. They formed in loess and the underlying calcareous, moderately fine textured, stratified sediment deposited by slack water.

In a representative profile, the surface layer is about 9 inches of dark grayish-brown and dark-brown, neutral silt loam. The subsoil is about 34 inches thick. The upper 3 inches is yellowish-brown, medium acid, friable silt loam. The lower part is dark yellowish-brown, medium to slightly acid, firm silt loam and silty clay loam that has gray and yellowish-brown mottles. The underlying material is yellowish-brown, mildly alkaline, friable silt loam that has gray and yellowish-brown mottles.

Uniontown soils have moderately slow permeability and high available water capacity. They are low in organic-matter content and natural fertility. The surface layer is dominantly strongly acid in areas not limed. Surface runoff is medium.

Representative profile of Uniontown silt loam, 2 to 6 percent slopes, eroded, in a cultivated field where the slope is 4 percent and faces east, 2,000 feet southeast of the northwest corner and 1,250 feet northeast of the west boundary of Clark Grant 112 in Clark County:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) and dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

B1—9 to 12 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable when moist; medium acid; clear, smooth boundary.

B21t—12 to 22 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, coarse, subangular blocky structure; firm when moist; thin, discontinuous, dark-brown (10YR 4/3) clay films on few peds and in root channels; medium acid; clear, wavy boundary.

B22t—22 to 29 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; common, medium, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/8) mottles; strong, coarse, angular blocky structure; firm when moist; thin, discontinuous, dark-brown (10YR 4/3) clay films on all peds; medium acid; gradual, wavy boundary.

B23t—29 to 36 inches, dark yellowish-brown (10YR 4/4) silt loam; common, medium, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/8) mottles; moderate, coarse, angular blocky structure and weak, thick, platy structure; firm when moist; thin, discontinuous, dark-brown (10YR 4/3) clay films on many peds; medium acid; clear, wavy boundary.

B3t—36 to 43 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; common, medium, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/8) mottles; weak, coarse, subangular blocky structure; firm when moist; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films on few peds; slightly acid; clear, wavy boundary.

C—43 to 60 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/8) mottles; massive; friable when moist; common lime concretions; mildly alkaline.

The solum ranges from 40 to 70 inches in thickness and is strongly acid to neutral. Loess ranges from 20 to 40 inches in thickness. Depth to bedrock is 15 to 20 feet. The Ap horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). It is strongly acid to neutral, depending on the amount of lime applied. The B2 horizon has a matrix color of dark brown (10YR 4/3) to yellowish brown (10YR 5/4). Consistence is firm or very firm. The C horizon ranges from yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4). It has stratified layers of silty clay, silty clay loam, silt loam, and fine sand.

Uniontown soils occupy areas adjacent to well drained to moderately well drained Markland soils. They have a thicker loess mantle, a less clayey subsoil, and are deeper to carbonates than Markland soils. Uniontown soils formed in materials similar to those in which the Henshaw soils formed, but they have less mottling in the upper part of the subsoil.

Uniontown silt loam, 2 to 6 percent slopes, eroded (UnB2).—This soil occupies narrow breaks on terraces. It is between higher lying soils on broad flats and lower lying soils on terraces or bottom lands. The profile of this soil is the one described as representative for the series. Included in mapping were a few areas of deep, somewhat poorly drained Henshaw soils and a few areas of well drained to moderately well drained Markland soils.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–3; woodland suitability group 1)

Uniontown silt loam, 6 to 12 percent slopes, eroded (UnC2).—This sloping soil occupies breaks on terraces. It occurs between higher lying soils on broad flats and lower lying soils on terraces or bottom lands. The profile of this soil is similar to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 40 inches. Included in mapping were small areas of yellowish-brown Uniontown soils that have a surface layer less than 3 inches thick. Also included were Uniontown soils that have slopes steeper than 12 percent.

This soil is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe–3; woodland suitability group 1)

Wakeland Series

The Wakeland series consists of deep, somewhat poorly drained soils on bottom lands that are subject to seasonal flooding. These nearly level soils are along most of the larger streams in the areas. They occupy long, narrow areas adjacent to soils on terraces or uplands. These soils formed in recent mixed alluvium that is medium or slightly acid.

In a representative profile, the surface layer is about 7 inches of grayish-brown, neutral silt loam. The subsoil is 53 inches thick. It is grayish-brown to yellowish-brown, slightly acid, friable silt loam that has brown, brownish-gray, and gray mottles.

Wakeland soils have moderate permeability and high available water capacity. They are low in organic-matter content and moderate in natural fertility. The plow layer is medium or slightly acid in areas not limed. Surface runoff is very slow or ponded.

Representative profile of Wakeland silt loam in a wooded area where the slope is 1 percent, 2,300 feet southwest of the northeast corner of NE¼ sec. 34 and 100 feet northwest of the Clark Military Grant boundary in Clark County:

O1—1 inch to 0, fresh and partly decomposed pine needles and twigs.

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable when moist; many small roots; neutral; abrupt, smooth boundary.

B21—7 to 17 inches, grayish-brown (10YR 5/2) silt (10 to 18 percent clay); common, fine, faint, brown (10YR 5/3) mottles; weak, fine, granular structure; friable when moist; many small roots; slightly acid; gradual, wavy boundary.

B22—17 to 30 inches, yellowish-brown (10YR 5/4) silt loam (10 to 18 percent clay); common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, fine, granular structure; friable when moist; few, small, brown shale fragments; slightly acid; gradual, wavy boundary.

B23—30 to 60 inches, brown (10YR 5/3) silt loam (10 to 18 percent clay); many, medium, distinct, gray (10YR 6/1) mottles; weak, fine, granular structure; friable when moist; few, small, brown shale fragments; few small iron concretions; slightly acid.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock ranges from 60 to 84 inches. The solum is medium acid or slightly acid. The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). The B horizon has a matrix color of dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4).

Wakeland soils occupy areas adjacent to moderately well drained Wilbur soils. They have a grayer subsoil that has more mottling in the upper part than Wilbur and Haymond soils. Wakeland soils have a less acid subsoil than Bartle soils and lack a fragipan, but they have similar drainage to that of these soils. Wakeland soils formed in materials similar to those in which the Wilbur and Haymond soils formed.

Wakeland silt loam (Wa).—This soil occupies long, narrow areas. Included in mapping were a few small areas of deep, moderately well drained Wilbur soils and a few small areas of deep, poorly drained soils on bottom lands. Also included were small areas of strongly acid, somewhat poorly drained soils on bottom lands; these soils have a silt loam or fine sandy loam surface layer.

This soil is well suited to corn (fig. 7) and soybeans. The main hazard is seasonal flooding between December

Figure 7.—Corn on Wakeland silt loam along Muddy Fork Creek in western Clark County. In the background is part of the forested "Knobs" area.

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and June. The main limitation is wetness. Small grain and alfalfa are subject to severe damage during prolonged periods of flooding. (Capability unit IIw-7; woodland suitability group 13)

Weikert Series

The Weikert series consists of shallow, excessively drained, very steep to extremely steep soils of the upland. These soils are on long steep slopes. They formed in material weathered from acid sandstone, siltstone, and shale.

In a representative profile, the surface layer is about 1 inch of very dark gray, very strongly acid, channery silt loam. The subsurface layer is about 4 inches of brown and pale-brown, strongly acid, channery silt loam. The subsoil and underlying material are light yellowish-brown, strongly acid, friable channery silt loam. Below this is brown, acid sandstone and shale bedrock at a depth of about 18 inches.

Weikert soils have moderate permeability and very low available water capacity. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is very rapid.

Representative profile of Weikert channery silt loam, 35 to 90 percent slopes, in a wooded area where the slope is 65 percent and faces northwest, 330 feet south and 500 feet east of the southwest corner of SE¼ sec. 12, T. 1 S., R. 5 E. in Clark County:

O1—2 inches to 1 inch, fresh hardwood leaves and twigs.

O2—1 inch to 0, partly decomposed leaves and twigs.

A1—0 to 1 inch, very dark gray (10YR 3/1) channery silt loam; weak, fine, granular structure; friable when moist; many small roots; very strongly acid; abrupt, smooth boundary.

A2—1 to 4 inches, brown (10YR 5/3) and pale-brown (10YR 6/3) channery silt loam; weak, fine, granular structure; friable when moist; many small roots and few woody roots ½ inch in diameter; 15 percent, by volume, sandstone fragments; strongly acid; clear, wavy boundary.

B2—4 to 14 inches, light yellowish-brown (10YR 6/4) channery silt loam; weak, fine, subangular blocky structure; friable when moist; many small roots; few very thin clay films in root channels; 50 percent, by volume, sandstone fragments; strongly acid; clear, wavy boundary.

C—14 to 18 inches, light yellowish-brown (10YR 6/4) channery silt loam; weak, fine, subangular blocky structure; friable when moist; roots ¼ inch in diameter; few pale-brown (10YR 6/3) silt films in root channels; 85 percent, by volume, sandstone fragments; strongly acid; clear, wavy boundary.

R—18 inches, brown acid sandstone, siltstone, and shale bedrock.

The solum ranges from 8 to 15 inches in thickness. Depth to sandstone, siltstone, and shale bedrock ranges from 8 to 20 inches. The quantity of sandstone and shale fragments in the solum ranges from 40 to 70 percent, by volume. The A2 horizon ranges from dark brown (10YR 4/3) to pale brown (10YR 6/3). The B horizon ranges from light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6). Where there is a C horizon, it ranges in color from light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6). The quantity of sandstone and shale fragments in the C horizon ranges from 50 to 90 percent.

Weikert soils formed in materials similar to those in which the Berks and Gilpin soils formed. They are on slopes adjacent to excessively drained Berks soils but have a thinner solum and are shallower to bedrock than Berks soils. The Weikert soils have a subsoil that is not so clayey as that of the Gilpin soils. Weikert soils have drainage similar to that of Rockcastle soils, but they are more acid and have a less clayey subsoil.

Weikert channery silt loam, 35 to 90 percent slopes (WcG).—This soil occupies long hillsides. In many places there are outcrops of sandstone, siltstone, and shale bedrock.

Included with this soil in mapping were areas of Berks channery silt loams, which make up about 20 percent of the unit. These soils have steep to extremely steep slopes and are on short, narrow ridges and on short slopes adjacent to ridges. Some areas of Berks soils are at the base of slopes in colluvial positions, where soil material has accumulated from higher Weikert soils. These soils have a thicker surface layer that has more organic matter, a thicker solum, and a cooler temperature than do Berks or Weikert soils in other positions. In some places there are large quantities of channery fragments and stones.

This soil is suited to trees. Erosion, runoff, and the slope are hazards in use and management. (Capability unit VIIe-2; woodland suitability group 22)

Weinbach Series

The Weinbach series consists of deep, somewhat poorly drained soils on terraces. These soils are along the Ohio River. They are nearly level and are on moderately broad ridges and in narrow areas along drainageways. They formed in loess and in the underlying medium-textured and moderately coarse textured stratified material. These soils have a slowly permeable fragipan.

In a representative profile, the surface layer is about 8 inches of dark-gray, neutral silt loam. The subsurface layer is about 4 inches of brown, strongly acid silt loam that has yellowish-brown and dark yellowish-brown mottles. The subsoil is about 43 inches of very strongly acid silt loam. The upper 16 inches is light brownish gray, firm, and has strong-brown mottles. The lower part is a fragipan that is dark brown, very firm, and brittle. The underlying material is dark-brown, strongly acid, friable silt loam.

Weinbach soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow.

Representative profile of Weinbach silt loam, 0 to 2 percent slopes, where the slope is 1 percent, 2,000 feet northeast of the southwest corner and 1,800 feet northeast of the west boundary of Clark Grant 10 in Clark County:

Ap—0 to 8 inches, dark-gray (10YR 4/1) silt loam; moderate, medium, granular structure; friable when moist; many mica flakes; neutral; abrupt, smooth boundary.

A2—8 to 12 inches, brown (10YR 5/3) silt loam; many, medium, distinct, yellowish-brown (10YR 5/8) and dark yellowish-brown (10YR 4/4) mottles and many, medium, faint, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable when moist; many mica flakes; common iron and manganese concretions; strongly acid; abrupt, wavy boundary.

B—12 to 28 inches, light brownish-gray (10YR 6/2) silt loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium, subangular blocky structure; firm when moist; many mica flakes; thin discontinuous clay films on few peds; very strongly acid; abrupt, wavy boundary.

Bxt—28 to 55 inches, dark-brown (10YR 4/3) heavy silt loam; strong, coarse, prismatic structure; very firm and

brittle when moist; thin discontinuous clay films on many peds and gray silt films on few peds; many mica flakes; very strongly acid; clear, wavy boundary.

C—55 to 65 inches, dark-brown (7.5YR 4/4) silt loam; pockets very fine sand and coarse silt; massive; friable when moist; many mica flakes; strongly acid.

The solum ranges from 48 to 72 inches in thickness. Depth to the fragipan ranges from 22 to 30 inches. Depth to bedrock ranges from 84 inches to more than 10 feet. The Ap horizon is dark gray (10YR 4/1) to grayish brown (10YR 5/2) and is strongly acid to neutral, depending on the amount of lime applied. Between the base of the A horizon and the top of the Bx horizon, the matrix is grayish brown (10YR 5/2) to pale brown (10YR 6/3) and texture is silt loam or silty clay loam. The Bx horizon has a matrix color of dark grayish brown (10YR 4/2) to brown (10YR 5/3) and is silt loam or silty clay loam. The C horizon is stratified silty clay loam, silt, and fine sand.

Weinbach soils formed in similar materials and occupy areas adjacent to well-drained Wheeling soils. They have a fragipan, which Wheeling soils lack, and they have a grayer subsoil and more mottling.

Weinbach silt loam, 0 to 2 percent slopes (WeA).—This soil occupies terraces. Included in mapping were a few small areas of deep, poorly drained soils on terraces. Also included were a few small areas of deep, moderately well drained soils that have a fragipan.

This soil is well suited to corn and soybeans. Runoff is slow, and wetness is the main limitation. (Capability unit IIw–3; woodland suitability group 5)

Wheeling Series

The Wheeling series consists of deep, well-drained soils on terraces. These soils are along the Ohio River. They are nearly level where they are on ridges, and they are gently sloping to steep in areas that adjoin flood plains. They formed in loess and in the underlying, moderately coarse textured, stratified material.

In a representative profile, the surface layer is about 11 inches of dark yellowish-brown, neutral silt loam. The subsoil is about 56 inches thick. The upper 6 inches is yellowish-brown, slightly acid, friable silt loam. The lower part is dark-brown to dark yellowish-brown, strongly acid, friable to firm fine sandy loam to clay loam. The underlying material is dark yellowish-brown, slightly acid, very friable sand and gravel.

Wheeling soils have moderate permeability and high to moderate available water capacity. They are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is slow to rapid.

Representative profile of a Wheeling silt loam in a cultivated field where the slope is 4 percent, 1,750 feet northeast of the southwest corner and 1,750 feet northeast of the west boundary of Clark Grant 4 in Clark County:

Ap—0 to 11 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, fine, granular structure; friable when moist; neutral; abrupt, smooth boundary.

B1—11 to 17 inches, yellowish-brown (10YR 5/6) silt loam; weak, medium, subangular blocky structure; friable when moist; many dark yellowish-brown (10YR 4/4) wormcasts; slightly acid; clear, wavy boundary.

IIB21t—17 to 31 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; thin, discontinuous, reddish-brown (5YR 4/4) clay films on many peds and in root channels; few dark yellowish-brown (10YR 4/4) wormcasts; strongly acid; clear, wavy boundary.

IIB22t—31 to 45 inches, dark-brown (7.5YR 4/4) very fine sandy loam; moderate, medium, subangular blocky structure; firm when moist; thin, discontinuous, reddish-brown (5YR 4/4) clay films on all peds; few dark-brown (7.5YR 4/4) wormcasts; strongly acid; abrupt, wavy boundary.

IIB31t—45 to 54 inches, dark yellowish-brown (10YR 4/4) silt loam containing streaks of brown (10YR 5/3); weak, medium, subangular blocky structure; firm when moist; thin, reddish-brown (5YR 4/4) clay films on few ped faces; strongly acid; abrupt, wavy boundary.

IIIB32t—54 to 67 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, coarse, subangular blocky structure; friable when moist; thin, reddish-brown (5YR 4/4) clay films on few ped faces; few brown (10YR 5/4) silt films; strongly acid; abrupt, wavy boundary.

IVC—67 to 73 inches, dark yellowish-brown (10YR 4/4) sand and gravel; single grain; very friable when moist; slightly acid.

The solum ranges from 48 to 72 inches in thickness. Loess ranges from 0 to 30 inches in thickness. Depth to bedrock ranges from 84 inches to more than 10 feet. The Ap horizon is dominantly dark yellowish brown (10YR 4/4) but ranges from dark brown (10YR 4/3) to yellowish brown (10YR 5/4). It ranges from silt loam to fine sandy loam and is strongly acid to neutral, depending on the amount of lime applied. The B2 horizon has a matrix color of dark brown (7.5YR 4/4) to yellowish brown (10YR 5/8) and is dominantly strongly acid or very strongly acid.

Wheeling soils formed in similar materials and are in areas adjacent to somewhat poorly drained Weinbach soils. They have a redder subsoil, less mottling, and lack the fragipan of the Weinbach soils.

Wheeling fine sandy loam, 2 to 6 percent slopes, eroded (WhB2).—This gently sloping soil occupies dunes on terraces. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark yellowish-brown to yellowish-brown fine sandy loam and is 3 to 9 inches thick. Included in mapping were a few small areas of Wheeling soils that have a loamy fine sand and sandy loam surface texture. Also included were small areas of moderately well drained soils that have a fragipan.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. This soil is subject to droughtiness late in summer and in fall. (Capability unit IIe–11; woodland suitability group 1)

Wheeling fine sandy loam, 6 to 12 percent slopes, eroded (WhC2).—This soil occupies dunes on terraces. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark yellowish-brown to yellowish-brown fine sandy loam and is 3 to 9 inches thick. Also, the combined thickness of the surface layer and subsoil is about 60 inches. Included in mapping were small areas of Wheeling soils that have a loamy fine sand and sandy loam surface layer. There were also a few areas of yellowish-brown Wheeling soils that have a surface layer less than 3 inches thick. Also included were areas of strongly sloping to extremely steep soils on escarpment breaks. In these soils the combined thickness of the surface layer and subsoil is 48 to 55 inches.

This soil is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. This soil is subject to droughtiness late in summer and in fall. (Capability unit IIIe–15; woodland suitability group 1)

Wheeling silt loam, 0 to 2 percent slopes (WlA).—This soil occupies terraces. The profile of this soil is similar

to that described as representative for the series, except that the combined thickness of the surface layer and subsoil is about 70 inches. Included with this soil in mapping were areas of Wheeling soils that have a loam or fine sandy loam surface layer. Also included were a few small areas of deep, moderately well drained soils that have a fragipan.

This soil is well suited to corn, soybeans, and small grain. (Capability unit I–1; woodland suitability group 1)

Wheeling silt loam, 2 to 6 percent slopes, eroded (WlB2).—This soil occupies terraces. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark yellowish brown to yellowish brown and is 3 to 9 inches thick. Included in mapping were areas of Wheeling soils that have a loam or fine sandy loam surface layer. Also included were small areas of deep, moderately well drained soils that have a fragipan.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe–3; woodland suitability group 1)

Wheeling silt loam, 6 to 12 percent slopes, eroded (WlC2).—This soil is on terraces. The profile of this soil is similar to that described as representative for the series, except that the surface layer is dark yellowish brown and is 3 to 9 inches thick. Also, the combined thickness of the surface layer and subsoil is about 60 inches. Included in mapping were areas of Wheeling soils that have a loam or fine sandy loam surface layer. Also included were a few areas of yellowish-brown Wheeling soils on escarpment breaks. The combined thickness of the surface layer and subsoil in these soils is 48 to 55 inches.

This soil is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe–3; woodland suitability group 1)

Wheeling silt loam, 12 to 18 percent slopes, eroded (WlD2).—This soil occupies terraces. The profile of this soil is similar to that described as representative for the series, except that the surface layer is 3 to 9 inches thick. Also, the combined thickness of the surface layer and subsoil is about 55 inches. Included with this soil in mapping were areas of Wheeling soils that have a loam or fine sandy loam surface layer. Also included were a few small areas of yellowish-brown Wheeling soils that have a surface layer less than 3 inches thick.

This soil is poorly suited to corn, soybeans, and small grain. It is excellent for alfalfa. Erosion and runoff are the main hazards in use and management. (Capability unit IVe–3; woodland suitability group 1)

Wilbur Series

The Wilbur series consists of deep, moderately well drained soils on bottom lands that are subject to seasonal flooding. These nearly level soils are in long, narrow areas along most of the larger streams in the survey area. They formed in recent mixed alluvium that is medium acid or slightly acid.

In a representative profile, the surface layer is about 9 inches of dark grayish-brown, neutral silt loam. The subsoil is 51 inches of slightly acid, friable silt loam that has grayish-brown mottles. The upper 22 inches is dark brown. The lower part is dark yellowish brown.

Wilbur soils have moderate permeability and high available water capacity. These soils are low in organic-matter content and moderate in natural fertility. The plow layer is medium acid or slightly acid in areas not limed. Surface runoff is slow or very slow.

A representative profile of Wilbur silt loam in a cultivated field 2,250 feet north and 250 feet east of the southwest corner of sec. 4, T. 1 S., R. 6 E., in Clark County:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

B21—9 to 22 inches, dark-brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) silt loam; few, fine, faint, grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure breaking to moderate, fine, granular structure; friable when moist; dark grayish-brown (10YR 4/2) organic stains on few peds and in root channels; slightly acid; clear, wavy boundary.

B22—22 to 31 inches, dark-brown (10YR 4/3) silt loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure breaking to weak, fine, granular structure; friable when moist; dark grayish-brown (10YR 4/2) organic stains on few peds and in root channels; slightly acid; gradual, wavy boundary.

B23—31 to 60 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; common, medium, distinct, grayish-brown (10YR 5/2) and gray (10YR 6/1) mottles; weak, coarse, subangular blocky structure; friable when moist; dark-brown (7.5YR 4/4) clay films on few peds; discontinuous dark grayish-brown (10YR 4/2) organic stains on few peds and in root channels; slightly acid.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock ranges from 60 to 84 inches. The solum is medium acid or slightly acid. The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). The B horizon has a matrix color of dark brown (10YR 4/3) to brown (10YR 5/3).

Wilbur soils are on bottom lands as are Haymond, Pope, and Wakeland soils. They occupy areas adjacent to somewhat poorly drained Wakeland soils. They are yellower, finer textured, and have a less acid subsoil than Pope soils. Wilbur soils have more mottling in the upper part of the subsoil than the Haymond and Wakeland soils. They are less gray in the subsoil than Wakeland soils.

Wilbur silt loam (Wm).—This soil occupies long, narrow areas. Included in mapping were a few small areas of deep, somewhat poorly drained Wakeland soils and a few small areas of deep, well-drained Haymond soils. Also included were small areas of strongly acid, moderately well drained bottom-land soils that have a silt loam or fine sandy loam surface layer.

This soil is well suited to corn and soybeans. The main hazard is seasonal flooding between December and June. Small grain and alfalfa are subject to severe damage during prolonged periods of flooding. (Capability unit I–2; woodland suitability group 8)

Zanesville Series

The Zanesville series consists of deep, well drained and moderately well drained soils that have a slowly permeable fragipan. These soils are gently sloping and sloping where they are on ridges and sloping and strongly sloping where they are on hillsides. They formed in loess,

and the underlying material weathered from sandstone, siltstone, and shale bedrock.

In a representative profile, the surface layer is about 9 inches of yellowish-brown, neutral silt loam. The subsoil is about 35 inches of silt loam. The upper 17 inches is yellowish brown to strong brown, slightly acid to strongly acid, and friable. The next 14 inches is a fragipan that is strong brown to light gray, strongly acid, and very firm and brittle. The lower part is light gray, strongly acid, friable, and has dark-brown and strong-brown mottles. The underlying material is yellowish-brown, very strongly acid, friable loam that is massive and has gray and red mottles. Below this is interbedded sandstone, siltstone, and shale bedrock.

Zanesville soils have slow permeability and moderate available water capacity. During seasons that have below normal rainfall or poor rainfall distribution, crops are subject to damage from drought. These soils are low in organic-matter content and natural fertility. The plow layer is dominantly strongly acid in areas not limed. Surface runoff is medium or rapid.

Representative profile of Zanesville silt loam, 6 to 12 percent slopes, eroded, in a wooded area where the slope is 9 percent and faces southeast, 100 feet east and 250 feet north of the southwest corner of the SE¼ sec. 34, T. 1 N., R. 5 E., in Clark County:

O1—2 inches to 1 inch, fresh hardwood leaves and twigs.
O2—1 inch to 0, partly decomposed leaves, twigs, and roots.
Ap—0 to 9 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, granular structure; friable when moist; many small roots; slightly acid; clear, smooth boundary.
B1—9 to 13 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, subangular blocky structure; friable when moist; many small roots; slightly acid; clear, smooth boundary.
B2t—13 to 26 inches, strong-brown (7.5YR 5/6) heavy silt loam; moderate, medium, subangular blocky structure; friable when moist; few small roots; thin, discontinuous, yellowish-red (5YR 5/6) clay films on few peds and in root channels; strongly acid; clear, wavy boundary.
Bx1t—26 to 29 inches, strong-brown (7.5YR 5/6) silt loam; moderate, medium, subangular blocky; very firm and brittle when moist; thin, discontinuous, yellowish-red (5YR 5/6) clay films on few peds; light yellowish-brown (10YR 6/4) silt films on few peds; strongly acid; gradual, smooth boundary.
Bx2t—29 to 40 inches, light-gray (10YR 7/2) silt loam; many, coarse, prominent, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) mottles; moderate, coarse, prismatic structure (massive inside peds); very firm and brittle when moist; thin, discontinuous, yellowish-red (5YR 5/6) clay films on few peds; strongly acid; diffuse, smooth boundary.
IIB3—40 to 44 inches, light-gray (10YR 7/2) silt loam; many, coarse, prominent, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; friable when moist; few small sandstone and shale fragments; strongly acid; diffuse, smooth boundary.
IIC—44 to 52 inches, yellowish-brown (10YR 5/6) loam; common, medium, distinct, gray and red mottles; massive; friable when moist, many small sandstone and shale fragments; few iron and manganese concretions; very strongly acid; clear, smooth boundary.
R—52 inches, interbedded sandstone, siltstone, and shale bedrock.

The solum ranges from 36 to 60 inches in thickness. Loess ranges from 36 to 48 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches. Depth to sandstone, siltstone, or shale bedrock ranges from 42 to 72 inches. The solum below the Ap horizon is dominantly strongly acid or very strongly acid. The Ap horizon is yellowish brown (10YR 5/4) to brown (10YR 5/3) and is strongly acid to neutral, depending on the amount of lime applied. Between the base of the A horizon and the top of the Bx horizon, the matrix is brown (7.5YR 5/4) to yellowish brown (10YR 5/6) and texture is silt loam or silty clay loam. The Bx horizon has a matrix color of strong brown (7.5YR 5/6) to light gray (10YR 7/2) and is silt loam or silty clay loam. The C horizon is silt loam or silty clay loam.

Zanesville soils formed in materials similar to those in which Gilpin and Johnsburg soils formed. Zanesville soils are in areas adjacent to well-drained Gilpin soils, but they have a deeper solum and have a fragipan, which Gilpin soils lack. Zanesville soils are redder in the upper part of the subsoil and have less gray mottling than the Johnsburg soils.

Zanesville silt loam, 2 to 6 percent slopes, eroded (ZaB2).—This soil occupies narrow ridges and short breaks between nearly level soils on ridges and sloping soils on hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is 3 to 8 inches thick and the combined thickness of the surface layer and subsoil is about 55 inches. Included with this soil in mapping were a few areas of Jennings silt loam, heavy subsoil variant, a few small areas of Zanesville soils that have a surface layer less than 3 inches thick, and areas that have a surface layer 8 to 11 inches thick. Also included were areas of a soil that is moderately well drained, has a fragipan, and is 55 to 72 inches deep to bedrock. This soil occupies terraces along the larger creeks in Clark and Floyd Counties.

The soil in this unit is well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIe-7; woodland suitability group 9)

Zanesville silt loam, 2 to 6 percent slopes, severely eroded (ZaB3).—This soil occupies narrow ridges and short breaks between nearly level soils on ridges and sloping soils on hillsides. The profile of this soil is similar to that described as representative for the series, except that the surface layer is less than 3 inches thick and the combined thickness of the surface layer and subsoil is about 52 inches. Also, it is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were a few areas of Jennings silt loam, heavy subsoil variant, and a few small areas of Zanesville soils that have a surface layer 3 to 8 inches thick. Also included were areas of a soil that is moderately well drained, has a fragipan, and is 55 to 72 inches to bedrock. This soil occupies terraces along the larger creeks in the western part of Clark and Floyd Counties.

The soil in this unit is moderately well suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe-7; woodland suitability group 9)

Zanesville silt loam, 6 to 12 percent slopes, eroded (ZaC2).—This soil occupies ridges and hillsides. The profile of this soil is the one described as representative for the series, except that the surface layer is 3 to 8 inches thick. Included in mapping were small areas of Zanesville soils that have a surface layer 8 to 11 inches thick, most of which are in small wooded areas. Also included were areas of Jennings silt loam, heavy subsoil variant, Zanesville soils that have a surface layer less than 3 inches thick, and small areas of moderately deep, well-drained Gilpin soils. There are also areas of a soil that is well

drained, has a fragipan, and is 55 to 72 inches deep to bedrock. This soil occupies terraces along the larger creeks in the western part of Clark and Floyd Counties.

The soil in this unit is moderately well suited to corn, soybeans and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IIIe-7; woodland suitability group 9)

Zanesville silt loam, 6 to 12 percent slopes, severely eroded (ZaC3).—This soil occupies ridges and hillsides. A few rills and small gullies are common. The profile of this soil is similar to that described as representative for the series, except that the surface layer is less than 3 inches thick and the combined thickness of the surface layer and subsoil is about 40 inches. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were small areas of moderately deep, well-drained Gilpin soils and a few areas of soils of the Jennings series, heavy subsoil variant. Also included were small areas of Zanesville soils that have a surface layer 3 to 8 inches thick and areas of a soil that is well drained, has a fragipan, and is 55 to 72 inches deep to bedrock. This soil occupies terraces along the larger creeks in the western part of Clark and Floyd Counties.

The soil in this unit is poorly suited to corn, soybeans, and small grain. Erosion and runoff are the main hazards in use and management. (Capability unit IVe-7; woodland suitability group 9)

Zanesville silt loam, 12 to 18 percent slopes, eroded (ZaD2).—This soil occupies hillside slopes that are smooth and nearly uniform. Rills are common in places. The profile of this soil is similar to that described as representative for the series, except that the surface layer is 3 to 8 inches thick. Also, the combined thickness of the surface layer and subsoil is about 38 inches, the fragipan is thinner and weaker, and depth to bedrock is about 45 inches. Included with this soil in mapping were small areas of Zanesville soils that have a surface layer less than 3 inches thick and areas of Jennings silt loam, heavy subsoil variant. Also included were small areas of moderately deep, well-drained Gilpin soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIe-1; woodland suitability group 9)

Zanesville silt loam, 12 to 18 percent slopes, severely eroded (ZaD3).—This soil occupies hillside slopes that are smooth and nearly uniform. There are numerous rills and small gullies. The profile of this soil is similar to that described as representative for the series, except that the surface layer is less than 3 inches thick, the combined thickness of the surface layer and subsoil is about 36 inches, the fragipan is thinner and weaker, and depth to bedrock is about 42 inches. Also, the surface layer of this soil is less friable, lower in organic-matter content and fertility, and more difficult to keep in good tilth than the original surface layer. Included in mapping were areas of Jennings silt loam, heavy subsoil variant, and a few small areas of Zanesville soils that have a surface layer 3 to 8 inches thick. Also included were small areas of moderately deep, well-drained Gilpin soils.

This soil is suited to permanent pasture or trees. Erosion and runoff are the main hazards in use and management. (Capability unit VIIe-1; woodland suitability group 9)

Zipp Series

The Zipp series consists of deep, very poorly drained soils on terraces. These soils are nearly level and are on broad flats and in slightly depressional areas between higher lying soils on uplands and lower lying soils on terraces. They formed in calcareous, fine-textured, stratified sediment deposited by slack water. These soils have a seasonally high water table.

In a representative profile, the surface layer is about 9 inches of dark-gray, neutral silty clay. The subsoil is about 41 inches of gray, neutral silty clay that has light olive-brown mottles. The underlying material is gray, neutral clay, silty clay, and silt that are calcareous in places.

Zipp soils have very slow permeability and high available water capacity. They are high in organic-matter content and natural fertility. The plow layer is slightly acid or neutral in areas not limed. Surface runoff is very slow or ponded.

Representative profile of Zipp silty clay in a cultivated field, 1,000 feet southeast of the northwest corner and 625 feet northeast of the west boundary of Clark Grant 33 in Clark County:

Ap—0 to 9 inches, dark-gray (N 4/0) silty clay; moderate, medium and coarse, granular structure; friable when moist; many small roots; neutral; abrupt, smooth boundary.

B21g—9 to 24 inches, gray (N 5/0) silty clay; common, fine, faint, light olive-brown (2.5Y 5/4) mottles; strong, coarse, angular blocky structure; very firm when moist; thin, discontinuous, clay films on pressure faces; few iron and manganese concretions; neutral; gradual, wavy boundary.

B22g—24 to 50 inches, gray (N 5/0) silty clay; common, medium, faint, light olive-brown (2.5Y 5/4) mottles; moderate, coarse, angular blocky structure; very firm when moist; thin, discontinuous, dark-gray (N 4/0) clay films on many peds; slickensides at 45 degree angle between depths of 40 and 50 inches; many managnese concretions; neutral; clear, smooth boundary.

C1—50 to 70 inches, gray (N 5/0) silty clay; massive; manganese splotches; neutral.

C2—70 to 80 inches, gray (N 5/0) stratified clay, silty clay, and silt; massive; plastic when wet; calcareous.

The solum ranges from 30 to 55 inches in thickness. It is slightly acid to moderately alkaline. Depth to bedrock ranges from 15 to 20 feet. The Ap horizon ranges from dark gray (N 4/0) to dark grayish brown (10YR 4/2). It is dominantly silty clay but ranges to silty clay loam. In undisturbed areas there is an A1 horizon 5 to 7 inches thick. The Bg horizon has a matrix color of dark gray (2.5Y 4/1) to gray (N 5/0) and ranges from silty clay loam to clay. The C horizon is dominantly gray (N 5/0) to dark gray (5Y 4/1) and has stratified layers of clay, silty clay, silty clay loam, clay loam, and silt loam. Calcareous nodules are in the C horizon in some places. Clay films in the profile may be a result of the movement of water in cracks rather than to illuviation.

Zipp soils occupy areas adjacent to very poorly drained Montgomery soils. They have a thinner surface layer than Montgomery soils. Zipp soils formed in materials similar to those in which Henshaw soils formed, but they have a grayer, more clayey subsoil and a darker surface layer.

Zipp silty clay (Zp).—This soil occupies broad flats and slightly depressional areas. Included in mapping were a

few small areas of Zipp soils that have a silty clay loam surface layer. Also included were small areas of a deep, very poorly drained soil that has a siltier subsoil and carbonates deeper in the profile than this Zipp soil. There are also small areas of deep, very poorly drained Montgomery soils.

This soil is moderately well suited to corn and soybeans. Runoff is very slow or ponded, and wetness is the main limitation. This soil is difficult to work. Because it becomes cloddy if tilled when too wet or too dry, a seedbed is difficult to prepare. (Capability unit IIIw-2; woodland suitability group 11)

Use and Management of the Soils

This section has five parts. The first part discusses the management of the soils of Clark and Floyd Counties for crops. Also given are yields of the principal crops when grown under two levels of management. The second part discusses the use and management of the soils for woodland, the third part deals with the use of the soils for wildlife, and the fourth part discusses the development of specific recreational facilities. The fifth part deals with soil properties that affect the use of the soils for engineering purposes.

Use of the Soils for Crops

In this subsection the management of cropland is discussed, the system of capability grouping used by the Soil Conservation Service is explained, the soils in each capability unit are described, and management suited to the soils in each unit is suggested. In addition, predicted average acre yields of the principal crops are given for all the soils in the survey area.

About 60 percent of Clark and Floyd Counties is in cultivation. The main crops are corn, soybeans, small grain, hay, and pasture. The principal forage crops are alfalfa, clover, and grass. Truck crops, including cucumbers, sweet corn, snapbeans, strawberries, cantaloups, and tomatoes, are also grown. A small acreage is in orchards and tobacco.

The major factor that affects the growth of crops is the ability of the soils to maintain an optimum moisture content and to permit the development of an adequate root system. Other factors are thickness of the surface layer, natural supply of plant nutrients, texture and consistence of the soil material, aeration, and depth to the water table.

Among the management practices needed on the soils in the survey area are (a) using cropping systems that keep tilth and maintain organic-matter content, (b) using cultural and mechanical practices to control erosion so that the properties of the soils are maintained or improved, (c) maintaining recommended levels of available phosphate, potassium, and nitrogen, (d) testing and liming soils in accordance with recommendations, (e) utilizing crop residue to the fullest extent in protecting and improving the soils, (f) practicing minimum tillage, (g) using adapted crop varieties, (h) controlling weeds by tillage and spraying, and (i) adequate drainage of wet areas.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, does not take into consideration possible but unlikely major reclamation projects, and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat. (None in Clark and Floyd Counties.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, water supply, or to esthetic purposes. (None in Clark and Floyd Counties.)

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is

limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States but not in Clark and Floyd Counties, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-3 or IIIw-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Capability unit numbers are generally assigned locally but are part of a statewide system. All of the units of the system are not represented in Clark and Floyd Counties; therefore, the capability unit numbers in this soil survey are not consecutive.

In the following pages, the capability units in Clark and Floyd Counties are described and suggestions for the use and management of the soils are given. The names of the soil series are given, but this does not mean that all soils of the series named are in that particular unit. To find the capability unit assigned any specific soil, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1

This unit consists of deep, nearly level soils of the Crider, Grayford, and Wheeling series. These are well-drained, medium-textured soils on uplands and terraces.

These soils are low in organic-matter content and natural fertility. They generally have high available water capacity and moderately slow permeability. The Wheeling soil, however, has moderate permeability. The surface layer is dominantly strongly acid in areas not limed.

These soils have few if any limitations and can be cultivated intensively. The major needs in management are to maintain organic-matter content and natural fertility and to keep good tilth. Use of crop residue and green-manure crops helps to maintain organic-matter content.

These soils are suited to corn, soybeans, small grain, hay, and pasture.

CAPABILITY UNIT I-2

This unit consists of deep, nearly level soils of the Haymond, Huntington, Lindside, and Wilbur series. These are well drained and moderately well drained, medium-textured soils on bottom lands along the Ohio River and its tributaries.

These soils have moderate permeability and high available water capacity. The Haymond and Wilbur soils are low in organic-matter content, and the Huntington and Lindside soils are moderate in organic-matter content. The Haymond and Wilbur soils are moderate in natural fertility, and the Huntington and Lindside soils are high in natural fertility. The surface layer of all these soils is medium acid to neutral. Flooding is a hazard from December to June.

The main needs in management are maintenance of organic-matter content and fertility. Use of crop residue and green-manure crops helps to maintain organic-matter content.

These soils are well suited to corn and soybeans. Alfalfa and fall-planted small grain are subject to severe damage during prolonged periods of flooding.

CAPABILITY UNIT IIe-3

This unit consists of deep, gently sloping, eroded soils of the Crider, Grayford, Uniontown, and Wheeling series. These are well-drained, medium-textured soils on uplands and terraces.

These soils are generally low in organic-matter content and natural fertility. They generally have high available water capacity and moderately slow permeability, but the Wheeling soil has moderate permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are hazards.

The main needs in management are maintenance of organic-matter content, improvement of fertility, keeping good tilth, and control of erosion. Use of crop residue and green-manure crops helps to increase organic-matter content and to improve fertility.

These soils are well suited to corn, soybeans, and small grain. Minimum tillage, contour farming, and grassed waterways help to control erosion.

CAPABILITY UNIT IIe-7

This unit consists of deep, gently sloping, eroded soils of the Bedford, Cincinnati, Hosmer, Jennings, Pekin, Rossmoyne, and Zanesville series, and of Jennings silt loam, heavy subsoil variant. These are moderately well drained and well drained, medium-textured soils that have a fragipan and are on uplands and terraces.

These soils generally are low in organic-matter content and natural fertility. They have moderate available water capacity. Permeability is generally slow, but the Bedford soil has very slow permeability. The surface layer is dominantly strongly acid in areas not limed. Some of these soils are well drained, which permits farming early in spring. Erosion and runoff are hazards. Wetness can cause prolonged delays in farming in spring. These soils are somewhat droughty in years of below normal rainfall or poor rainfall distribution. This occasionally results in crop damage.

The major needs in management are maintenance of organic-matter content and fertility, keeping good tilth, and control of erosion. Minimum tillage, contour farming, and grassed waterways help to control erosion. Use of crop residue and green-manure crops helps to increase organic-matter content and fertility.

These soils are well suited to corn, soybeans, and small grain. They are not well suited to alfalfa, because the fragipan restricts roots and because of wetness early in spring.

CAPABILITY UNIT IIe-11

This unit consists only of Wheeling fine sandy loam, 2 to 6 percent slopes, eroded. This is a deep, well-drained, moderately coarse textured, eroded soil that has a friable subsoil. It occupies gently sloping dunes on terraces.

This soil is low in organic-matter content and natural fertility. It has moderate available water capacity and permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are hazards. This soil is subject to droughtiness late in summer and in fall.

The main needs in management are maintenance of organic-matter content, improvement of fertility, keeping good tilth, and control of erosion. Use of crop residue and green-manure crops helps to increase organic-matter content and to improve fertility.

This soil is well suited to corn, soybeans, and small grain. Minimum tillage, contour farming, and grassed waterways help to control erosion.

CAPABILITY UNIT IIs-1

This unit consists only of Pope silt loam. This is a moderately deep, well-drained, medium-textured soil that has a friable subsoil. It occupies long, narrow, nearly level bottom lands adjacent to stream channels and on alluvial fans.

This soil is low in organic-matter content and natural fertility. It has low available water capacity and moderate permeability. The surface layer is medium to slightly acid in areas not limed. The main hazard is seasonal flooding between December and June. The main limitation is droughtiness, which occurs in summer and fall.

The main need in management is maintenance of organic-matter content and fertility. Use of crop residue and green-manure crops helps to maintain organic-matter content.

This soil is well suited to corn and soybeans.

CAPABILITY UNIT IIw-2

This unit consists only of Henshaw silt loam, 0 to 2 percent slopes. This is a deep, somewhat poorly drained, medium-textured soil. It occupies nearly level terraces between higher lying soils on uplands and lower lying soils on terraces or bottom lands.

This soil is low in organic-matter content and natural fertility. It has high available water capacity and moderately slow permeability. The surface layer is dominantly strongly acid in areas not limed. Runoff is slow, and wetness is the major limitation.

The main needs in management are maintenance of organic-matter content and fertility and control of wetness. Use of crop residue and green-manure crops helps to improve organic-matter content and fertility.

This soil is well suited to corn and soybeans if a suitable drainage system is established and maintained. It is not well suited to alfalfa, because of prolonged excessive wetness.

CAPABILITY UNIT IIw-3

This unit consists of deep, nearly level and gently sloping soils of the Avonburg, Bartle, and Weinbach series. These are somewhat poorly drained, medium-textured soils that have a fragipan and are on uplands and terraces.

These soils are low in organic-matter content and natural fertility. They have moderate available water capacity and slow permeability. The fragipan restricts roots and the movement of water and air. The surface layer is dominantly strongly acid in areas not limed. Runoff is slow, and wetness is the major limitation.

The main needs in management are maintenance of organic-matter content and fertility and control of wetness. Use of crop residue and green-manure crops helps to improve organic-matter content and fertility.

These soils are well suited to corn and soybeans if a suitable drainage system is established and maintained. They are not well suited to alfalfa because of prolonged excessive wetness and because root development is restricted by the fragipan.

CAPABILITY UNIT IIw-5

This unit consists of deep, nearly level soils of the Bedford, Hosmer, Jennings, and Rossmoyne series. These are moderately well drained and well drained, medium-textured soils that have a fragipan and are on uplands.

These soils are low in organic-matter content and natural fertility. They have moderate available water capacity. These soils generally have slow permeability, but the Bedford soil has very slow permeability. The fragipan restricts roots and the movement of water and air. The surface layer is dominantly strongly acid in areas not limed. Runoff is slow, and wetness early in spring is a limitation. These soils are somewhat droughty in years of below normal rainfall or poor rainfall distribution. This occasionally results in crop damage.

The main needs in management are maintenance of organic-matter content and fertility and control of wetness. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility. A suitable drainage system allows earlier planting of crops in spring and contributes greatly to higher production.

These soils are well suited to corn, soybeans, and small grain. They are not well suited to alfalfa, because the fragipan restricts roots and because of wetness early in spring.

CAPABILITY UNIT IIw-7

This unit consists of deep, nearly level soils of the Newark and Wakeland series. These are somewhat poorly drained, medium-textured soils on bottom lands along the Ohio River and its tributaries.

These soils are low or moderate in organic-matter content and moderate or high in natural fertility. They have high available water capacity and moderate permeability. The surface layer is naturally medium acid to neutral. Wetness is a limitation, and flooding is a hazard. These soils are subject to sedimentation if flooded.

The main needs in management are maintenance of organic-matter content and fertility and control of wetness. Use of crop residue and green-manure crops helps to maintain the organic-matter content. Delayed plant-

ing of crops in spring after the normal period of flooding helps to avoid damage or loss from flooding.

These soils are well suited to corn and soybeans if a suitable drainage system is established and maintained. Small grain and alfalfa are subject to severe damage during periods of prolonged flooding.

CAPABILITY UNIT IIIe-3

This unit consists of deep, gently sloping, severely eroded soils and of sloping, eroded soils of the Crider, Grayford, Hagerstown, Uniontown, and Wheeling series. These are well-drained, medium-textured soils on uplands and terraces.

These soils are low in organic-matter content and natural fertility. They have high available water capacity and slow to moderate permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are the major hazards.

The main needs in management are maintenance of organic-matter content and fertility, keeping good tilth, and control of erosion. Minimum tillage, contour farming, stripcropping, diversion terraces, winter cover crops, and grassed waterways help to control erosion and runoff. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility and to keep tilth.

These soils are moderately well suited to corn, soybeans, and small grain.

CAPABILITY UNIT IIIe-7

This unit consists of deep, gently sloping, severely eroded soils and of sloping, eroded soils of the Cincinnati, Hosmer, Jennings, Rossmoyne, and Zanesville series. These are moderately well drained and well drained, medium-textured soils that have a fragipan and are on uplands.

These soils are low in organic-matter content and natural fertility. They have moderate available water capacity and slow permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are hazards.

The main needs in management are maintenance of organic-matter content and fertility, keeping good tilth, and control of erosion. Minimum tillage, contour farming, stripcropping, diversion terraces, winter cover crops, and grassed waterways help to control erosion and runoff. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility and to keep tilth.

These soils are moderately well suited to corn, soybeans, and small grain.

CAPABILITY UNIT IIIe-15

This unit consists only of Wheeling fine sandy loam, 6 to 12 percent slopes, eroded. This is a deep, well-drained, moderately coarse textured soil that has a friable subsoil. It occupies sloping dunes on terraces.

This soil is low in organic-matter content and natural fertility. It has moderate available water capacity and permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are hazards. This soil is subject to droughtiness late in summer and in fall. The main needs in management are maintenance of organic-matter content and fertility, keeping good tilth, and control of erosion. Use of terracing or stripcropping, contour farming, and grassed waterways helps to control erosion.

This soil is moderately well suited to corn, soybeans, and small grain.

CAPABILITY UNIT IIIw-2

This unit consists of deep, nearly level and depressional soils of the Montgomery and Zipp series. These are very poorly drained, fine-textured soils on terraces.

These soils are high in organic-matter content and natural fertility. They have high available water capacity and very slow permeability. The surface layer is slightly acid or neutral. Runoff is very slow or ponded, and wetness is the major limitation. These soils are difficult to work. They become cloddy if tilled when too wet or too dry, and therefore a seedbed is difficult to prepare.

The main needs in management are maintenance of organic-matter content, improvement of fertility, keeping good tilth, and control of wetness. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility.

These soils are moderately well suited to corn and soybeans if a suitable drainage system is established and maintained. These soils are not well suited to small grain or alfalfa, because of excessive wetness in winter and early in spring.

CAPABILITY UNIT IIIw-3

This unit consists only of Johnsburg silt loam, 0 to 2 percent slopes. It is a deep, somewhat poorly drained, medium-textured soil that has a fragipan. It occupies nearly level upland positions.

This soil is low in organic-matter content and natural fertility. It has moderate available water capacity and very slow permeability. The fragipan in the subsoil restricts roots and the movement of water and air. The surface layer is dominantly strongly acid in areas not limed. Runoff is slow, and wetness is the major limitation.

The main needs in management are maintenance of organic-matter content and fertility and control of wetness. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility.

This soil is moderately well suited to corn and soybeans if a suitable drainage system is established and maintained. It is not well suited to alfalfa, because of prolonged excessive wetness and because roots are restricted by the fragipan.

CAPABILITY UNIT IIIw-10

This unit consists only of Bonnie silt loam. This is a deep, poorly drained, medium-textured soil. It occupies low, broad, nearly level or slightly depressional areas on bottom lands. These areas are adjacent to higher lying soils on terraces or uplands.

This soil is low in organic-matter content and natural fertility. It has high available water capacity and slow permeability. The surface layer is dominantly strongly acid in areas not limed. Runoff is very slow, and wetness is the major limitation. Flooding occurs in winter and spring.

The main needs in management are maintenance of organic-matter content and fertility and control of wet-

ness. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility.

This soil is suited to pasture. If drainage is adequate, it is moderately well suited to corn and soybeans.

CAPABILITY UNIT IIIw-12

This unit consists only of Clermont silt loam. This is a deep, poorly drained, medium-textured soil that has a fragipan. It occupies broad, nearly level ridges on uplands.

This soil is low in organic-matter content and natural fertility. It has moderate available water capacity and very slow permeability. The fragipan restricts roots and the movement of water and air. The surface layer is dominantly strongly acid in areas not limed. Runoff is very slow, and wetness is the major limitation.

The main needs in management are maintenance of organic-matter content and fertility and control of wetness. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility.

This soil is moderately well suited to corn and soybeans if a suitable drainage system is established and maintained. It is not well suited to alfalfa because of prolonged excessive wetness and because the roots are restricted by the fragipan.

CAPABILITY UNIT IVe-3

This unit consists of deep, sloping, severely eroded soils and of strongly sloping, eroded soils of the Crider, Grayford, Hagerstown, and Wheeling series. These are well-drained, medium-textured soils on uplands and terraces.

These soils are low in organic-matter content and natural fertility. They have high available water capacity and slow to moderate permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are the major hazards.

The main needs in management are maintenance of organic-matter content and fertility, keeping good tilth, and control of erosion. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility and to keep tilth. Minimum tillage, contour farming, stripcropping, diversion terraces, and grassed waterways help to control erosion and runoff.

These soils are poorly suited to corn, soybeans, and small grain.

CAPABILITY UNIT IVe-7

This unit consists of deep, sloping, severely eroded soils and of strongly sloping, eroded soils of the Cincinnati, Hosmer, Jennings, heavy subsoil variant, and Zanesville series. These are well drained and moderately well drained, medium-textured soils that have a fragipan and are on uplands.

These soils are low in organic-matter content and natural fertility. They have moderate available water capacity and slow permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are the major hazards. The main needs in management are maintenance of organic-matter content and fertility, keeping good tilth, and control of erosion. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility and to keep tilth. Minimum tillage, contour farming, stripcropping, diversion terraces, and grassed waterways help to control erosion and runoff.

These soils are poorly suited to corn, soybeans, and small grain.

CAPABILITY UNIT IVe-8

This unit consists of moderately deep, sloping, eroded soils of the Gilpin, Rarden, and Trappist series. These are well-drained, medium-textured soils on uplands.

These soils are low in organic-matter content and natural fertility. They have low or moderate available water capacity and slow or moderate permeability. The surface layer is dominantly strongly acid in areas not limed. Erosion and runoff are the major hazards.

The main needs in management are maintenance of organic-matter content and natural fertility, keeping good tilth, and control of erosion. Use of crop residue and green-manure crops helps to maintain organic-matter content and fertility and to keep tilth. Minimum tillage, contour farming, stripcropping, diversion terraces, and grassed waterways help to control erosion and runoff.

These soils are poorly suited to corn, soybeans, and small grain.

CAPABILITY UNIT IVe-11

This unit consists only of deep, well-drained, medium-textured Markland silt loam, 6 to 12 percent slopes, eroded. It occupies terraces on sloping to steep breaks. These breaks are between higher lying soils on terraces or uplands and lower lying soils on terraces or bottom lands.

This soil is low in organic-matter content and natural fertility. It has high available water capacity and slow permeability. The surface layer is medium acid to neutral. Erosion and runoff are hazards. The main needs in management are maintenance of organic-matter content and fertility, keeping good tilth, and control of erosion. Use of crop residue and green-manure crops helps to improve and maintain organic-matter content and fertility and to keep tilth. Terracing, stripcropping, contour farming, minimum tillage, conservation of residue, and grassed waterways help to control erosion and to maintain fertility.

This soil is poorly suited to corn, soybeans, and small grain.

CAPABILITY UNIT VIe-1

This unit consists of deep and moderately deep, sloping to steep, eroded and severely eroded soils of the Cincinnati, Crider, Gilpin, Grayford, Hagerstown, Hickory, Markland, Rarden, Trappist, and Zanesville series. These are well drained and moderately well drained, medium-textured and moderately fine textured soils on uplands.

These soils are low in organic-matter content and natural fertility. They have low to high available water capacity and slow to moderate permeability. The surface layer is dominantly strongly acid or medium acid in areas not limed. The Zanesville soils in this unit have a fragipan that restricts roots and the movement of water and air. Erosion and runoff are the major hazards.

The main needs in management are keeping good tilth and control of erosion. A permanent vegetative cover helps to control erosion and runoff. Use of contour farming and minimum tillage during seedbed preparation when estab-

lishing permanent pasture helps to control erosion and runoff.

These soils are suited to permanent pasture or trees.

CAPABILITY UNIT VIe-2

This unit consists only of shallow, excessively drained, medium-textured Corydon stony silt loam, 12 to 25 percent slopes. This soil occupies hillsides on uplands.

This soil is high in organic-matter content and moderate in natural fertility. It has very low available water capacity and moderately slow permeability. The surface layer is neutral. Surface runoff is very rapid. Erosion and runoff are the major hazards.

The main needs in management are maintenance of organic-matter content, improvement of fertility, and control of erosion. A permanent cover of vegetation helps control erosion and runoff. Other useful practices are minimum tillage during seedbed preparation, renovation on the contour, and controlled grazing.

This soil is suited to permanent pasture or trees.

CAPABILITY UNIT VIIe-1

This unit consists of shallow, moderately deep and deep, strongly sloping to extremely steep, eroded and severely eroded soils of the Corydon, Gilpin, Markland, Rarden, Trappist, and Zanesville series and Gullied land. These soils are generally well drained to moderately well drained, but the Corydon soil is excessively drained. They are medium-textured and moderately fine textured soils on uplands (fig. 8).

These soils generally are low in organic-matter content and in natural fertility. The Corydon soil, however, is high in organic-matter content and moderate in natural fertility. All of these soils have very low to high available water capacity. Most have slow permeability. The Gilpin soil, however, has moderate permeability, and the Corydon soil has moderately slow permeability. The surface layer is strongly acid to neutral. Surface runoff is medium to very rapid. Erosion and runoff are the major hazards in use and management. Maintenance of a permanent tree or grass cover helps to control runoff and erosion. Areas suited to grazing should not be overgrazed.

These soils are not suited to cultivation, but they are suited to selected hardwood and evergreen trees or to permanent pasture. Well-established native grasses grow well enough to provide limited grazing.

CAPABILITY UNIT VIIe-2

This unit consists of shallow and moderately deep, strongly sloping to extremely steep, eroded or severely eroded soils of the Berks, Colyer, Fairmount, Rockcastle, and Weikert series. These are excessively drained, medium-textured and moderately fine textured soils that are dominantly stony, shaly, or channery and are on uplands.

Figure 8.—Corydon stony silt loam, 25 to 70 percent slopes. Outcrops of limestone are in foreground and on hillsides.

These soils generally are low in organic-matter content and natural fertility. The Fairmount soil, however, is high in organic-matter content and natural fertility. The soils in this unit have low or very low available water capacity and slow to moderate permeability. The surface layer is strongly acid to neutral. Surface runoff is very rapid. Erosion and runoff are the major hazards in use and management. Maintenance of a permanent tree or grass cover helps to control runoff and erosion. Areas suited to grazing should not be overgrazed.

These soils are not suited to cultivation. They are suited to selected hardwood and evergreen trees or to permanent pasture. Well-established native grasses grow well enough to provide limited grazing.

CAPABILITY UNIT VIIe-3

Only the land type Pits is in this unit. It consists of limestone, sandstone, and shale quarries, and of pits. Some of the limestone quarried is crushed fine for farm use. Limestone, sandstone, and shale are also used in industry. The pits are of various shapes and depths. Some of the pits are on terraces along the Ohio River, where sand and gravel are excavated. Other pits are on uplands, where soil material is excavated for roads, highways, fill material for building foundations, and other uses.

A few willows and shrubs grow in many of the crevices at the bottom of the quarries and pits and provide habitat for wildlife. Some abandoned quarries and pits are suitable for stocking with fish and development for wildlife habitat.

Predicted yields

Table 2 lists average acre yields of selected crops that can be expected on each soil in the area under two levels of management. In columns A are yields to be expected under an average or medium level of management, and in columns B are yields to be expected under the improved or high level of management that some farmers in the survey area are now practicing.

The yields are predicted averages for a 5- to 10-year period. They are based on farm records, on interviews with farmers and members of the staff of the Purdue Agricultural Experiment Station, and on direct observation by soil conservationists. Considered in making the predictions were the prevailing climate, the characteristics of the soils, and the influence of different kinds of management on the soils.

It should be understood that these yield figures may not apply directly to specific tracts of land for any particular year, because the soils differ somewhat from place to place, management practices differ slightly from farm to farm, and weather conditions vary from year to year. Nevertheless, these estimates are useful in showing the relative productivity of the soils and how soils respond to improved management.

The management needed to get the yields in columns A includes—

1. Using a cropping system that maintains tilth and organic-matter content.
2. Using management practices that reduce erosion enough that the quality of the soils is not greatly impaired.
3. Using moderate applications of fertilizer and lime as determined by soil tests.
4. Returning most of the crop residue to the soil.
5. Plowing and tilling by conventional methods.
6. Planting crop varieties that are generally suited to the climate and soils.
7. Controlling weeds by tillage and spraying.
8. Draining wet soils enough to allow farming but not enough to prevent reduction of yields.

The management needed to get the yields in columns B includes—

1. Using a cropping system that maintains tilth and organic-matter content.
2. Controlling erosion to the maximum extent possible, so that quality of the soils is maintained or improved rather than impaired.
3. Maintaining a high level of fertility by means of frequent soil tests and use of fertilizer as recommended by the Purdue University Agricultural Experiment Station.
4. Testing and liming soils in accordance with recommendations.
5. Utilizing crop residue to the fullest extent to protect and improve the soil.
6. Practicing minimum tillage.
7. Using only the best suited crop varieties.
8. Controlling weeds by tillage and spraying.
9. Adequately draining wet soils so that wetness does not restrict yields of crops.

Woodland [2]

The geographic location of Clark and Floyd Counties makes them very desirable for woodland crops. The area is in a vegetative transition belt, where northern hardwood trees are commonly mixed with southern hardwood species. The vast number of suited species, the long growing season (approximately 190 days), and the favorable rainfall pattern all contribute to the production of good timber crops. The wooded areas are concentrated mainly in the "Knobs" area.

The Indiana Soil and Water Conservation Needs Inventory, published in 1961 by the Cooperative Extension Service of Purdue University, shows 121,800 acres of woodland in the area. This inventory predicts that by the year 1975 the acreage in woodland will decrease to 109,800 acres, or approximately 32 percent of the total acreage.

The kinds of trees or forest cover and the growth of trees are influenced by the characteristics of the soils. Woodland crops grow at a rate directly related to the characteristics of the soils. An understanding of the relationship between the kind of soil, potential of the area for woodland crops, and management makes it possible to operate wood-producing areas most efficiently.

In addition to the production of wood crops, all woodlands should also be evaluated for other uses. Such areas also have value for erosion control, watershed protection, wildlife areas, and recreation sites, and for their scenic beauty.

[2] JOHN O. HOLWAGER, woodland conservationist, Soil Conservation Service, helped to prepare this subsection.

Table 2.—*Predicted average acre yields of principal crops under two levels of management*

[Yields in columns A are those to be expected over a 10-year period under average management; yields in columns B are those to be expected under improved or high level management. Absence of yield figure indicates that crop is not suited to the soil or is not commonly grown on it]

Soil	Corn		Soybeans		Wheat		Oats		Clover-grass hay		Alfalfa-grass hay	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Avonburg silt loam, 0 to 2 percent slopes	65	90	25	35	30	40	40	55	2.0	3.0	2.0	3.0
Avonburg silt loam, 2 to 4 percent slopes	65	90	25	35	30	40	40	55	2.0	3.0	2.0	3.0
Bartle silt loam	65	90	25	35	30	40	40	55	2.0	3.0	2.0	3.0
Bedford silt loam, 0 to 2 percent slopes	65	90	25	35	30	40	40	55	2.0	3.0	2.5	3.5
Bedford silt loam, 2 to 6 percent slopes	55	80	23	28	23	32	35	45	2.0	2.5	2.5	3.5
Berks channery silt loam, 18 to 35 percent slopes												
Bonnie silt loam									2.0	2.5		
Cincinnati silt loam, 2 to 6 percent slopes, eroded	55	80	23	28	23	32	35	45	2.0	2.5	2.5	3.5
Cincinnati silt loam, 6 to 12 percent slopes, eroded	50	75	20	25	20	30	32	40	1.7	2.2	2.3	3.5
Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	45	70			18	25			1.3	2.0	2.0	3.0
Cincinnati silt loam, 12 to 18 percent slopes, eroded	40	65			15	22			1.3	2.0	2.0	3.0
Cincinnati silt loam, 12 to 18 percent slopes, severely eroded									1.3	2.0	1.8	2.7
Clermont silt loam	65	95	25	35					2.0	2.5	2.0	2.5
Colyer shaly silt loam, 18 to 35 percent slopes									1.0	1.5	1.5	2.3
Corydon stony silt loam, 12 to 25 percent slopes									1.0	2.0	2.0	3.0
Corydon stony silt loam, 25 to 70 percent slopes												
Crider silt loam, 0 to 2 percent slopes	80	110	30	40	37	45	60	80	2.0	2.7	3.5	5.0
Crider silt loam, 2 to 6 percent slopes, eroded	75	105	25	35	32	40	55	75	2.0	2.7	3.5	5.0
Crider silt loam, 2 to 6 percent slopes, severely eroded	70	100	20	30	30	35	40	70	1.5	2.5	3.0	4.5
Crider silt loam, 6 to 12 percent slopes, eroded	65	95	20	30	30	35	40	65	1.5	2.5	3.0	4.5
Crider silt loam, 6 to 12 percent slopes, severely eroded	50	75	16	24	30	32	35	60	1.5	2.5	2.5	3.5
Crider silt loam, 12 to 18 percent slopes, eroded	45	70	16	24	25	30	35	50	1.5	2.5	2.5	3.5
Crider silt loam, 12 to 18 percent slopes, severely eroded									1.3	2.2	2.0	3.0
Fairmount silty clay loam, 12 to 25 percent slopes							15	25	1.3	2.3	2.3	3.2
Fairmount stony silty clay loam, 25 to 70 percent slopes												
Gilpin silt loam, 6 to 12 percent slopes, eroded	45	70			20	30			1.5	2.0	2.0	3.0
Gilpin silt loam, 6 to 12 percent slopes, severely eroded	40	65			18	25			1.3	1.7	1.7	2.5
Gilpin silt loam, 12 to 18 percent slopes, eroded					15	23			1.1	1.5	1.5	2.3
Gilpin silt loam, 12 to 18 percent slopes, severely eroded									1.1	1.5	1.5	2.3
Gilpin silt loam, 18 to 25 percent slopes, eroded									1.1	1.5	1.5	2.3
Grayford silt loam, 0 to 2 percent slopes	80	110	30	40	37	45	60	80	2.0	2.7	3.5	5.0
Grayford silt loam, 2 to 6 percent slopes, eroded	75	105	25	35	32	40	55	75	2.0	2.7	3.5	5.0
Grayford silt loam, 6 to 12 percent slopes, eroded	65	95	20	30	30	35	50	65	1.5	2.5	3.0	4.5
Grayford silt loam, 6 to 12 percent slopes, severely eroded	50	75	16	24	30	32	35	60	1.5	2.5	2.5	3.5
Grayford silt loam, 12 to 18 percent slopes, eroded	45	70	16	24	25	30	35	50	1.5	2.5	2.5	3.5
Grayford silt loam, 12 to 18 percent slopes, severely eroded									1.3	2.2	2.0	3.0
Grayford silt loam, 18 to 25 percent slopes, eroded									1.3	2.2	2.0	3.0
Gullied land									1.0	2.0	1.5	2.5
Hagerstown silt loam, 6 to 12 percent slopes, eroded	60	90	18	25	25	30	35	60	1.5	2.5	2.5	4.0
Hagerstown silt loam, 12 to 18 percent slopes, eroded	40	65	16	22	18	27	30	45	1.5	2.5	2.5	3.0
Hagerstown silt loam, 18 to 25 percent slopes, eroded									1.2	2.1	1.9	2.3
Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	45	70	16	22	25	27	30	55	1.0	2.0	2.0	3.0
Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded									1.3	2.2	2.0	2.5
Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded									1.1	2.0	1.8	2.0
Haymond silt loam	65	95	22	30					2.0	3.0	2.5	4.0

TABLE 2.—*Predicted average acre yields of principal crops under two levels of management*—Continued

Soil	Corn		Soybeans		Wheat		Oats		Clover-grass hay		Alfalfa-grass hay	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Henshaw silt loam, 0 to 2 percent slopes	70	95	30	35	35	45	45	80	2.2	3.3	3.0	4.0
Hickory silt loam, 18 to 25 percent slopes, eroded	—	—	—	—	—	—	—	—	1.3	2.2	2.0	3.0
Hosmer silt loam, 0 to 2 percent slopes	65	90	25	35	30	40	40	55	2.0	3.0	2.5	3.5
Hosmer silt loam, 2 to 6 percent slopes, eroded	55	80	23	28	23	32	35	45	2.0	2.5	2.5	3.5
Hosmer silt loam, 6 to 12 percent slopes, eroded	50	75	20	25	20	30	32	40	1.7	2.2	2.3	3.5
Hosmer silt loam, 6 to 12 percent slopes, severely eroded	45	70	—	—	18	25	—	—	1.3	2.0	2.0	3.0
Hosmer silt loam, 12 to 18 percent slopes, eroded	40	65	—	—	15	22	—	—	1.3	2.0	2.0	3.0
Huntington silt loam	70	100	25	35	—	—	—	—	2.0	3.0	2.5	4.5
Jennings silt loam, 0 to 2 percent slopes	65	90	25	35	30	40	40	55	2.0	3.0	2.0	3.0
Jennings silt loam, 2 to 6 percent slopes, eroded	55	80	23	28	23	32	35	45	2.0	2.5	2.5	3.5
Jennings silt loam, heavy subsoil variant, 2 to 6 percent slopes, eroded	55	80	23	28	23	32	35	45	2.0	2.5	2.5	3.5
Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, eroded	50	75	20	25	20	30	32	40	1.7	2.2	2.3	3.5
Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, severely eroded	45	70	—	—	18	25	—	—	1.3	2.0	2.0	3.0
Jennings silt loam, heavy subsoil variant, 12 to 18 percent slopes, eroded	—	—	—	—	—	—	—	—	1.3	2.0	1.8	2.7
Johnsburg silt loam, 0 to 2 percent slopes	60	85	20	30	28	35	35	50	1.8	2.7	—	—
Lindside silt loam	67	95	22	33	—	—	—	—	2.0	3.0	2.2	3.7
Markland silt loam, 6 to 12 percent slopes, eroded	50	75	16	24	30	32	35	60	1.5	2.5	2.5	3.5
Markland silt loam, 12 to 18 percent slopes, eroded	—	—	14	20	20	25	30	50	1.3	2.2	2.0	3.0
Markland silt loam, 18 to 25 percent slopes, eroded	—	—	—	—	—	—	—	—	1.3	2.0	1.8	2.7
Montgomery silty clay	80	105	28	38	25	33	—	—	—	—	—	—
Newark silt loam	65	90	20	30	—	—	—	—	1.5	2.5	2.0	2.5
Pekin silt loam, 2 to 6 percent slopes, eroded	55	80	23	28	23	32	35	45	2.0	2.5	2.5	3.5
Pits	—	—	—	—	—	—	—	—	—	—	—	—
Pope silt loam	60	80	20	25	25	32	35	48	1.3	2.2	2.0	3.0
Rarden silt loam, 6 to 12 percent slopes, eroded	35	50	—	—	16	24	—	—	1.2	1.7	1.7	2.5
Rarden silt loam, 12 to 18 percent slopes, eroded	—	—	—	—	12	18	—	—	1.0	1.3	1.3	1.8
Rarden silty clay loam, 6 to 12 percent slopes, severely eroded	—	—	—	—	14	20	—	—	1.0	1.5	1.5	2.0
Rarden silty clay loam, 12 to 18 percent slopes, severely eroded	—	—	—	—	—	—	—	—	.8	1.0	1.0	1.6
Rockcastle silt loam, 18 to 55 percent slopes	—	—	—	—	—	—	—	—	—	—	—	—
Rossmoyne silt loam, 0 to 2 percent slopes	65	90	25	35	30	40	40	55	2.0	3.0	2.5	3.5
Rossmoyne silt loam, 2 to 6 percent slopes, eroded	55	80	23	28	23	32	35	45	2.0	2.5	2.5	3.5
Rossmoyne silt loam, 2 to 6 percent slopes, severely eroded	50	75	20	25	20	30	30	40	1.7	2.0	2.3	3.2
Trappist silt loam, 6 to 12 percent slopes, eroded	45	70	—	—	20	30	—	—	1.5	2.0	2.0	3.0
Trappist silt loam, 6 to 12 percent slopes, severely eroded	40	65	—	—	18	25	—	—	1.3	1.7	1.7	2.5
Trappist silt loam, 12 to 18 percent slopes, eroded	40	65	—	—	18	25	—	—	1.3	1.7	1.7	2.5
Trappist silt loam, 12 to 18 percent slopes, severely eroded	—	—	—	—	—	—	—	—	1.1	1.5	1.5	2.3
Uniontown silt loam, 2 to 6 percent slopes, eroded	75	105	25	35	32	40	55	75	2.0	2.7	3.5	5.0
Uniontown silt loam, 6 to 12 percent slopes, eroded	65	95	20	30	30	35	40	65	1.5	2.5	3.0	4.5
Wakeland silt loam	65	90	20	30	—	—	—	—	1.5	2.5	2.0	2.5
Weikert channery silt loam, 35 to 90 percent slopes	—	—	—	—	—	—	—	—	—	—	—	—
Weinbach silt loam, 0 to 2 percent slopes	65	90	25	35	30	40	40	55	2.0	3.0	2.0	3.0
Wheeling fine sandy loam, 2 to 6 percent slopes, eroded	70	100	22	33	30	37	52	70	1.5	2.5	3.0	4.5
Wheeling fine sandy loam, 6 to 12 percent slopes, eroded	60	85	18	27	25	30	40	60	1.0	2.0	2.5	4.0
Wheeling silt loam, 0 to 2 percent slopes	80	110	30	40	37	45	60	80	2.0	2.7	3.5	5.0
Wheeling silt loam, 2 to 6 percent slopes, eroded	75	105	27	37	35	42	57	75	2.0	2.7	3.5	5.0
Wheeling silt loam, 6 to 12 percent slopes, eroded	70	100	22	33	30	37	52	70	1.5	2.5	3.0	4.5
Wheeling silt loam, 12 to 18 percent slopes, eroded	60	85	18	27	25	30	40	60	1.0	2.0	2.5	4.0
Wilbur silt loam	65	92	20	30	—	—	—	—	2.0	3.0	2.2	3.7
Zanesville silt loam, 2 to 6 percent slopes, eroded	55	80	23	28	23	32	35	40	2.0	2.5	2.5	3.5

TABLE 2.—*Predicted average acre yields of principal crops under two levels of management*—Continued

Soil	Corn		Soybeans		Wheat		Oats		Clover-grass hay		Alfalfa-grass hay	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Zanesville silt loam, 2 to 6 percent slopes, severely eroded	50	75	20	25	20	30	30	37	1. 7	2. 0	2. 3	3. 3
Zanesville silt loam, 6 to 12 percent slopes, eroded	45	70	18	23	17	27	27	35	1. 3	1. 8	2. 1	3. 1
Zanesville silt loam, 6 to 12 percent slopes, severely eroded	40	65	15	20	15	25	25	30	1. 1	1. 6	1. 8	2. 8
Zanesville silt loam, 12 to 18 percent slopes, eroded	------	------	------	------	------	------	------	------	1. 0	1. 4	1. 6	2. 5
Zanesville silt loam, 12 to 18 percent slopes, severely eroded	------	------	------	------	------	------	------	------	. 8	1. 2	1. 4	2. 0
Zipp silty clay	80	105	28	38	25	33	------	------	------	------	------	------

The soils of the survey area vary widely in their suitability for wood crops. The major characteristics of soils that affect their productivity for trees are the ability of the soils to maintain an optimum moisture content and to permit the development of an adequate root system. Other characteristics that affect the growth of timber crops are thickness of the surface layer, natural supply of plant nutrients, texture and consistence of the soil material, aeration, and depth to the water table.

Upland oaks are the main woodcrop species in the survey area, but white oak, red oak, black oak, hickory, and white ash are the dominant species. Tulip-poplar generally grows on the lower parts of slopes, on slopes of cool aspect (north- and northeast-facing slopes), and in coves. Species naturally occurring with tulip-poplar are white ash, red oak, white oak, hickory, beech, black walnut, and black cherry.

Other woodland species that grow in the survey area are pin oak, shortleaf pine, and Virginia pine. Pin oak commonly occurs with red maple, ash, swamp white oak, red river birch, sweetgum, and hickory. Shortleaf pine and Virginia pine grow mainly on Gullied land and are the most common species planted. Virginia pine is native to this area and reseeds very satisfactorily in abandoned fields.

Woodland suitability groups

To assist landowners in planning the use of their soils, the soils in Clark and Floyd Counties have been placed in 15 woodland groups. Each group is made up of soils that have similar characteristics that affect the growth of trees and similar limitations and hazards in woodland use and management.

Site index ratings for woodland crops of upland oak, tulip-poplar, pin oak, shortleaf pine, and Virginia pine are given for each group of soils these trees grow on. Site index indicates the total height attained by the dominant trees of a given species, growing on the specified soil, at the age of 50 years. For example, a site index of 80 for upland oaks means that the dominant oak trees on a given site will average 80 feet in height at the age of 50 years.

Height-growth data in USDA Tech. Bul. No. 560 (*3*) were used in determining the site index for upland oaks. For tulip-poplar, site-index data were obtained from tulip-poplar growth curves constructed by W. T. Doolittle, United States Forest Service, in October 1957. For pin oak, the site index was determined from the sweetgum growth curves given in the Forestry Handbook (*6*). For Virginia pine, the site index curve used was from the North Carolina State College Tech. Bul. No. 100 (*5*). For shortleaf pine the site index curve used was from USDA Misc. Pub. No. 50 (*7*).

Site index can be translated into quantitative estimates of yield and annual growth by use of yield tables developed by the Soil Conservation Service. Yields for site index 50 through 80 were developed from USDA Tech. Bul. 560 (*3*), as adapted by Case, Gengrich, and Lloyd in 1962. Yields for site index 90 to 110 were developed from data in USDA Handbook 181 (*2*), as adapted by Case in 1962.

The woodland suitability groups are not consecutive because these groups are based on a statewide listing of woodland suitability groups, and many are not applicable to Clark and Floyd Counties.

For each woodland suitability group, ratings are given for the limitations and hazards of the soils for woodland use. These hazards and limitations are explained in the following paragraphs.

Seedling mortality refers to the expected degree of mortality of natural seedlings or planting stock as influenced by the kind of soil, the hazard of erosion, and the direction of slope. The rating is *slight* if ordinarily adequate natural regeneration will take place. The rating is *moderate* if natural regeneration cannot always be relied upon for adequate and immediate restocking. It is *severe* if considerable replanting, special preparation of seedbed, and use of superior planting techniques are required to assure satisfactory stands.

Erosion hazard refers to the potential for soil erosion that can exist following cutting operations and where the soil is exposed, as along roads, skid trails, fire lanes, and log decking areas. Soil characteristics that affect erosion hazard are slope, stability of soil aggregates, infiltration, permeability, and coarse fragments. The rating is *slight* if erosion hazard is negligible. The rating is *moderate* if the erosion hazard requires attention and practices are employed for control. It is *severe* if the

erosion hazard is great, requiring intensive management for control.

Windthrow hazard is an evaluation of soil characteristics that control tree root development and therefore affect resistance to wind. The rating is *slight* if no special hazards are recognized. Individual trees are expected to remain standing when released on all sides. The rating is *moderate* if root development is adequate for stability except during periods of excessive wetness or great wind velocity. It is *severe* if depth of tree rooting does not give adequate stability and individual trees are likely to be blown over if released on all sides. It is extremely important that landowners understand this hazard if they expect to thin a stand of trees for use as homesites or park and recreation areas.

Equipment limitation is an evaluation of soil characteristics and topographic features that restrict or prohibit the use of conventional equipment for planting and harvesting wood crops, for constructing roads, and for controlling fires. The rating is *slight* if there is no restriction on the kind of equipment used or on the time of year it can be used. It is *moderate* if there is a seasonal restriction of less than three months, or if some moderate restrictions are present due to slope, wetness, rockiness, or other physical characteristics. It is *severe* if there is a seasonal restriction on operating machinery for more than 3 months of the year or other extreme restrictions exist because of steep slopes or extreme wetness. This type of hazard often requires detailed scheduling of logging, and sometimes specially adapted equipment is essential.

The following is a description of each of the 15 woodland suitability groups recognized in Clark and Floyd Counties. The site index and estimated productivity potential of woodland crops (Doyle Rule) is also given.

WOODLAND SUITABILITY GROUP 1

This unit consists of nearly level to strongly sloping soils of the Crider, Grayford, Hagerstown, Uniontown, and Wheeling series. Most of these soils are eroded or severely eroded.

These soils are well suited to timber production. Seedling mortality is slight or moderate. It is as high as 50 percent on soils that are severely eroded and that occupy south-facing slopes. The erosion hazard is slight or moderate. Windthrow hazard is only slight, because there is no restriction to root development. Equipment limitation is slight on slopes of less than 12 percent and moderate on slopes greater than 12 percent.

Tree species most common in this group are red oak, white oak, tulip-poplar, black walnut, black oak, and hickory.

The site index is 85 to 95 for upland oaks, 90 to 105 for tulip-poplar, and 73 to 78 for sweetgum. Estimated productivity potential in board feet per acre per year is 300 to 375 for upland oaks, 335 to 450 for tulip-poplar, and 205 to 245 for sweetgum.

WOODLAND SUITABILITY GROUP 2

This unit consists only of Hickory silt loam, 18 to 25 percent slopes, eroded.

This soil is well suited to timber production. Seedling mortality is moderate on south-facing slopes. The erosion hazard is moderate. Equipment limitation is moderate or severe. Special logging equipment is needed on slopes greater than 18 percent.

Tree species most common in this group are black walnut, hickory, red oak, white oak, and tulip-poplar.

The site index is 85 to 95 for upland oaks and 95 to 105 for tulip-poplar. Estimated productivity potential in board feet per acre per year is 300 to 375 for upland oaks and 375 to 450 for tulip-poplar.

WOODLAND SUITABILITY GROUP 5

This unit consists of nearly level to gently sloping soils of the Avonburg, Bartle, Henshaw, Johnsburg, and Weinbach series.

These soils are moderately well suited to timber production. Seedling mortality is slight and is usually less than 25 percent. In exceptionally wet years, excess water on the surface may cause poor seedling stands and planting can be difficult. The erosion hazard is slight. Windthrow hazard is severe because of shallow root development caused by the high water table and a slowly permeable fragipan (fig. 9). Equipment limitations are moderate. Logging is impractical late in winter and early in spring because of extreme wetness. Logging operations during this period result in damage to tree roots and soil structure.

Tree species most common in this group are pin oak, red river birch, soft maple, sweetgum, swamp white oak, and white ash.

The site index is 80 to 92 for upland oaks, 85 to 100 for pin oak, and 75 to 85 for sweetgum. Estimated productivity potential in board feet per acre per year is 260 to 350 for upland oaks, 300 to 415 for pin oak, and 220 to 300 for sweetgum.

Figure 9.—Tree roots extending laterally on top of the fragipan in an Avonburg silt loam. This slowly permeable layer starts where the knife is shown at a depth of about 2 feet.

WOODLAND SUITABILITY GROUP 6

This unit consists of moderately steep soils of the Grayford and Hagerstown series. These soils are eroded or severely eroded.

These soils are moderately well suited to timber production. Seedling mortality usually is slight, but it is as high as 50 percent on soils that are severely eroded and occupy south-facing slopes. The erosion hazard is moderate to severe. Because these soils are highly erodible, gullies form quickly if the surface is disturbed. Because of the variable depth of the soils, further erosion is a critical hazard and will affect timber growth and quality. There is sufficient rooting depth to prevent windthrow. Equipment limitation is moderate to severe.

Tree species most common in this group are red oak, tulip-poplar, white ash, and white oak.

The site index is 75 to 79 for upland oaks and 75 to 85 for tulip-poplar. Estimated productivity potential in board feet per acre per year is 220 to 250 for upland oaks and 220 to 300 for tulip-poplar.

WOODLAND SUITABILITY GROUP 7

This unit consists of moderately steep to steep soils of the Corydon and Fairmount series.

These soils are poorly suited to timber production. Seedling mortality usually is slight, but it is as high as 50 percent on soils that occupy south-facing slopes. The erosion hazard is moderate to severe because of the slope and shallow depth of the soils. Gullies usually do not form, but the soil washes out from between the stones. Windthrow hazard is moderate to severe. It is a critical problem because of the shallowness and stoniness of the soils. The steep slopes and exposed rock make logging operations very difficult, and special logging equipment is needed.

The most desirable of the commonly occurring tree species in this group are black walnut, chinquapin oak, red oak, white oak, tulip-poplar, and white ash. Species that are also suitable are basswood and blue ash.

The site index is 70 to 85 for upland oaks on south-facing slopes. On north-facing slopes it is 80 to 90 for upland oaks and 80 to 95 for tulip-poplar. Estimated productivity potential in board feet per acre per year is 185 to 300 for upland oaks on south-facing slopes. On north-facing slopes it is 260 to 335 for upland oaks and 360 to 375 for tulip-poplar.

WOODLAND SUITABILITY GROUP 8

This unit consists of nearly level soils of the Haymond, Huntington, Lindside, Pope, and Wilbur series.

These soils are well suited to timber production. The limitations or hazards for seedling mortality, erosion, windthrow, and equipment are slight. Occasional flooding is often beneficial to establishment of seedlings, especially cottonwood, sycamore, and soft maple. Most of the trees are in relatively narrow strips bordering major streams because most of the soils are used for grain.

Tree species most common in this group are cottonwood, black walnut, soft maple, sycamore, tulip-poplar, and white ash.

The site index is 95 to 105 for tulip-poplar. Estimated productivity potential in board feet per acre per year is 375 to 450 for tulip-poplar.

WOODLAND SUITABILITY GROUP 9

This unit consists of nearly level to moderately sloping soils of the Bedford, Cincinnati, Hosmer, Jennings, Pekin, Rossmoyne, and Zanesville series. Most of these soils are eroded or severely eroded.

These soils are moderately well suited to timber production. Seedling mortality is slight and usually is less than 25 percent. The erosion hazard is slight to severe. Windthrow hazard is moderate because of shallow rooting caused by the fragipan. Equipment limitation is slight. The severely eroded soils in this group are used for and are suited to Virginia pine and shortleaf pine.

Tree species most common in this group are black oak, hickory, tulip-poplar, and white ash (fig. 10).

The site index is 75 to 85 for upland oaks and 90 to 100 for tulip-poplar. Estimated productivity potential in board feet per acre per year is 220 to 300 for upland oaks and 335 to 415 for tulip-poplar.

WOODLAND SUITABILITY GROUP 10

This unit consists of sloping to moderately steep soils of the Gilpin and Trappist series. These soils are eroded or severely eroded.

These soils are moderately well suited to timber production. Seedling mortality is slight and usually is less than 25 percent. The erosion hazard is moderate. The location of logging trails on ridgetops, along the narrow bottom lands, or along the contour helps to control erosion. Where it is necessary to locate skid trails up and down the slope, cutoff ditches are needed to prevent gully formation. Windthrow hazard is moderate or severe in some areas because of shallowness to bedrock. Equipment limitation is moderate or severe. On the steeper slopes, special logging equipment is needed to harvest the crop.

Tree species most common in this group are beech, black oak, red oak, white oak, hickory, and tulip-poplar.

The site index for upland oaks on south-facing slopes is 69 to 82. On north-facing slopes it is 75 to 85 for upland oaks and 90 to 100 for tulip-poplar. Estimated productivity potential in board feet per acre per year is 180 to 280 for upland oaks on south-facing slopes. On north-facing slopes it is 220 to 300 for upland oaks and 335 to 415 for tulip-poplar.

WOODLAND SUITABILITY GROUP 11

This unit consists of nearly level soils of the Bonnie, Clermont, Montgomery, and Zipp series.

These soils are poorly suited to timber production. Seedling mortality is moderate. It is as high as 50 percent because of excessive moisture in spring. The erosion hazard is slight. Windthrow hazard is moderate or severe because of shallow root development caused by the high water table. Equipment limitation is severe. Late in winter and early in spring, logging is impractical because of extreme wetness. Logging operations during this period are likely to result in damage to the roots and soil structure.

Tree species most common in this group are pin oak, soft maple, sweetgum, sycamore, tulip-poplar, and white ash.

The site index is 90 to 105 for tulip-poplar and 85 to 105 for pin oak. Estimated productivity potential in board feet per acre per year is 335 to 450 for tulip-poplar and 300 to 450 for pin oak.

Figure 10.—**Stand of white oak and black oak on Cincinnati silt loam, 6 to 12 percent slopes, eroded.**

WOODLAND SUITABILITY GROUP 12

This unit consists only of moderately steep to steep Berks channery silt loam.

This soil is poorly suited to timber production. Seedling mortality is slight and usually is less than 25 percent. The erosion hazard is moderate because this soil is shallow and has steep slopes. There generally is sufficient rooting depth to prevent windthrow. Equipment limitation is severe. The use of equipment is limited both by steep slopes and rocks.

The most desirable of the commonly occurring tree species in this group are white ash, black oak, red oak, white oak, and Virginia pine. Species that are suitable are chestnut oak, post oak, and scarlet oak.

The site index on south-facing slopes is 75 to 92 for upland oaks. On north-facing slopes it is 80 to 90 for upland oaks and tulip-poplar. Estimated productivity potential in board feet per acre per year is 220 to 350 for upland oaks on south-facing slopes. It is 260 to 335 for upland oaks and tulip-poplar on north-facing slopes.

WOODLAND SUITABILITY GROUP 13

This unit consists of nearly level soils of the Newark and Wakeland series.

These soils are moderately well suited to timber production. Seedling mortality is slight and usually is less than 25 percent. The erosion hazard is slight. Windthrow hazard is moderate because of the shallow rooting caused by the high water table. Equipment limitation is moderate. Logging operations during the wet season may damage the shallow roots and the soil structure.

Tree species most common in this group are cottonwood, pin oak, soft maple, sweetgum, and sycamore.

The site index is 50 to 70 for shortleaf pine and 45 to 60 for Virginia pine. Estimated productivity potential in board feet per acre per year is 220 to 390 for shortleaf pine and 175 to 250 for Virginia pine.

WOODLAND SUITABILITY GROUP 14

This unit consists only of Gullied land.

This land type is poorly suited to timber production. Seedling mortality is slight or moderate. It is as high as 50 percent in areas that are very severely eroded and are on south-facing slopes. Trafficability is poor because of previous severe gullying and such continued use may contribute to further gullying. The erosion hazard is severe. Windthrow hazard is moderate because of shallow depth

to bedrock. Equipment limitation is severe. Use of equipment is limited by gullying and the exposed bedrock.

Hardwood stands are rare or are absent. Planting of pine is done primarily for erosion control.

The site index is 50 to 70 for shortleaf pine and 45 to 60 for Virginia pine. Estimated productivity potential in board feet per acre per year is 220 to 390 for shortleaf pine and 175 to 250 for Virginia pine.

WOODLAND SUITABILITY GROUP 16

This unit consists only of Pits.

This land type is very poorly suited for woodcrops. Seedling mortality is slight and is usually less than 25 percent. The extremely rough topography is an advantage in holding seed in place until germination takes place. The erosion hazard is slight or moderate on the steep and broken topography. During the first few years after areas of this land type are abandoned, erosion helps to level steep ridges. Windthrow is only a slight hazard, because tree roots generally can develop deeply. The rough, broken topography presents a severe limitation to use of equipment and makes logging very difficult. Special logging equipment is necessary to harvest the crop. In some instances it is necessary to construct logging roads on the ridges.

Tree species most common in this group are cottonwood, green ash, red oak, soft maple, and sycamore.

Information on site index and estimated productivity potential of hardwoods is not available for this group. The site index is 72 to 85 for shortleaf pine and 53 to 72 for Virginia pine. Estimated productivity potential in board feet per acre per year is 200 to 300 for shortleaf pine and 100 to 200 for Virginia pine.

WOODLAND SUITABILITY GROUP 18

This unit consists of sloping to moderately steep soils of the Markland series. These soils are eroded.

These soils are moderately well suited to timber production. Seedling mortality is slight and usually is less than 25 percent. The erosion hazard is moderate on the short, steep slopes. Windthrow hazard is slight. A moderate or severe equipment limitation exists on the short, steep slopes.

Tree species most common in this group are basswood, hickory, black oak, red oak, and white oak.

The site index is 70 to 80 for upland oaks. Estimated productivity potential in board feet per acre per year is 185 to 260 for upland oaks.

WOODLAND SUITABILITY GROUP 22

This unit consists of sloping to very steep soils of the Colyer, Rarden, Rockcastle, and Weikert series. Most of these soils are eroded or severely eroded.

These soils are very poorly suited to timber production. Seedling mortality is moderate to severe and is usually more than 50 percent. The shallowness of these soils and their position on steep, south-facing slopes or on narrow ridgetops makes them too dry for seedling survival. The erosion hazard is moderate to severe on the steeper slopes. Erosion should be guarded against in all operations because of the shallowness of these soils. Windthrow hazard is moderate to severe because of the limited depth for root growth. Equipment limitation is moderate to severe. On the steeper slopes, special logging equipment is necessary to harvest the crop.

The most desirable of the commonly occurring tree species in this group are chestnut oak and Virginia pine. Also suitable are hickory, post oak, and scarlet oak. If a poorly stocked stand of hardwoods exists on these soils, the owner should probably consider conversion to pines.

The site index is 45 to 55 for upland oaks. Estimated productivity potential in board feet per acre per year is 70 to 110 for upland oaks.

Shrub and tree plantings

This section gives information about some of the shrubs and trees used for wind protection, screening of unsightly areas, and the general beautification of neighborhoods.

Trees and shrubs of different species vary widely in suitability for different soils and site conditions. The soils in the survey area are placed in groups mainly on the basis of the amount of wetness because of a seasonal high water table and the available moisture capacity. Each of the soils in a specific group has similar suitability for tree and shrub plantings.

Table 3 lists suitable uses for specified plants on soils in Clark and Floyd Counties. The plants given in the table are only a partial list of the plants suited to the soils in the county. Many of the plants serve a dual purpose of landscaping and of providing food and cover for wildlife. If more detail is needed and pertinent landscaping plans are desired, landowners and others should communicate with local landscape specialists.

Wildlife

The soils, topography, climate, and wide variety of vegetation favor the development of wildlife habitat in Clark and Floyd Counties. These features provide a high potential for managing the land to increase and maintain various kinds of wildlife.

Three major kinds of wildlife are recognized in these counties. These are open-land wildlife, woodland wildlife, and wetland wildlife. There is a high potential for development of open-land wildlife and woodland wildlife habitat throughout most of the area. Only small, local areas have a suitable potential for kinds of wildlife that prefer wetland habitats. The three major kinds of wildlife are defined as follows:

Open-land wildlife.—Birds, mammals, and reptiles that normally frequent fields and pasture overgrown by grasses, herbs, and shrubs. Examples of open-land wildlife are rabbit, red fox, skunk, quail, and meadowlarks. Elements of wildlife habitat used in rating soils for this kind of wildlife are seed and grain crops, grasses and legumes, wild herbaceous upland plants, and hardwood woodland plants.

Woodland wildlife.—Mammals and birds that frequent areas of hardwood and coniferous trees, shrubs, or a combination of vegetation. Examples of woodland wildlife are squirrel, deer, raccoon, woodpeckers, and nuthatches. Elements of wildlife habitat used in rating soils for this kind of wildlife are grasses and legumes, wild herbaceous upland plants, hardwood woodland plants, and coniferous woodland plants.

Wetland wildlife.—Mammals, birds, and reptiles that frequent wet areas, such as ponds, marshes, and swamps. Examples of wetland wildlife are muskrat, wild duck, and wild geese, kingfishers, and red-winged blackbirds. Elements of wildlife habitat used in rating soils for this kind of wildlife are wetland food and cover plants and seed and grain crops; limitations for shallow water developments and excavated ponds are also considered.

In table 4 the soils in Clark and Floyd Counties are rated according to their capability of providing habitat for each of the three kinds of wildlife. For a rating other than well suited, the productivity rating of the soil for providing habitat elements used by the three kinds of wildlife is also given.

A rating of *well suited* means habitats are generally easily created, improved, or maintained. There are few or no limitations that affect management. A rating of *suited* means that habitats generally can be created, improved, or maintained, but there are moderate soil limitations that affect management. A rating of *poorly suited* means habitats can generally be created, improved, or maintained, but there are rather severe soil limitations.

TABLE 3.—*Guide for shrub and tree plantings*

[Interpretations are not given for Gullied land (Gu) and Pits (Ps), because they are so variable. The letter "X" indicates species is suitable for the specified use. Absence of entry indicates that on the soils in the group the plant is not suitable for the specified use]

Site description and soil series	Plant names	Uses: Screen	Uses: Ornamental or shade	Uses: Wildlife food and cover	Uses: Planting in road cuts and eroded areas	Potential height	Sun tolerant	Shade tolerant	Remarks
						Feet			
Deep, poorly drained and very poorly drained, nearly level and depressional soils that have a seasonal high water table near the surface: Bonnie, Clermont, Montgomery, Zipp.	Arborvitae, American.	X	X			20–30	Yes	Yes	Evergreen; makes a good hedge.
	Baldcypress		X			50–60	Yes	No	Sheds needles in fall.
	Birch, red river	X	X			50–60	Yes	Yes	Red to pink bark.
	Dogwood, red-osier	X		X		6–10	Yes	Yes	Good plant for borders and wildlife food.
	Dogwood, silky	X		X	X	6–8	Yes	Yes	White flowers, purplish-red stems.
	Elderberry	X		X	X	6–8	Yes	No	Flat clusters of white flowers.
	Honeysuckle, Amur	X		X	X	10–15	Yes	Yes	Good food plant for songbirds.
	Maple, red		X		X	50–60	Yes	Yes	Variable color in fall.
	Oak, pin		X	X		60–80	Yes	No	Red color in fall.
	Poplar, Lombardy	X	X		X	40–50	Yes	No	Slender, columnar growth.
	Sweetgum		X			60–80	Yes	No	Red to scarlet color in fall.
	Willow, purple-osier (medium and tall).	X				15–20	Yes	No	Used for field windbreaks.
Deep, somewhat poorly drained, nearly level and gently sloping soils that have a seasonal high water table at a depth of 1 to 3 feet: Avonburg, Bartle, Henshaw, Johnsburg, Newark, Wakeland, Weinbach.	Arrow-wood	X		X	X	6–10	Yes	Yes	Attractive flower and fruit.
	Autumn-olive	X		X	X	6–10	Yes	No	Silver leaves, red fruit.
	Cherry, Cornelian	X	X	X		6–8	Yes	No	Trims well into hedges.
	Dogwood, red-osier	X		X	X	6–10	Yes	Yes	Good border and wildlife plant.
	Highbush-cranberry	X	X	X	X	6–10	Yes	Yes	Holds red fruit into winter.
	Honeysuckle, Amur	X		X	X	10–15	Yes	Yes	Good food plant for songbirds.
	Honeysuckle, Tartarian.	X		X	X	8–12	Yes	Yes	Fruit a red berry, good food for birds.
	Pine, shortleaf		X		X	80–100	Yes	No	Evergreen; yellowish-green needles.
	Pine, Virginia	X	X	X	X	60–80	Yes	No	Evergreen; rapid growing and hardy.
	Pine, white	X	X			100–120	Yes	No	Evergreen; blue-green needles.
	Regel privet	X		X	X	6–8	Yes	No	Attractive fruit holds into winter.
	Spicebush			X	X	8–10	No	Yes	Leaves and fruit have spicy odor.
	Spruce, Norway	X	X			60–80	Yes	Yes	Evergreen; short needles.
	Sumac, cutleaf	X		X	X	8–10	Yes	No	Large, red fruit.
	Sycamore		X		X	90–100	Yes	No	Bark in attractive patches.
	Tulip-poplar		X			100–120	Yes	No	State tree of Indiana; yellow, tuliplike flowers.

TABLE 3.—*Guide for shrub and tree plantings*—Continued

Site description and soil series	Plant names	Uses: Screen	Uses: Ornamental or shade	Uses: Wildlife food and cover	Uses: Planting in road cuts and eroded areas	Potential height	Sun tolerant	Shade tolerant	Remarks
						Feet			
Deep, well drained and moderately well drained nearly level to steep soils that have a seasonal high water table at a depth of more than 3 feet: Bedford, Cincinnati, Crider, Grayford, Hagerstown, Haymond, Hickory, Hosmer, Huntington, Jennings, Jennings, heavy subsoil variant, Lindside, Markland, Pekin, Pope, Rossmoyne, Uniontown, Wheeling, Wilbur, Zanesville.	Autmn-olive	X		X	X	6–10	Yes		Silver leaves, red fruit.
	Birch, white		X			30–40	Yes	Yes	Plant in clumps.
	Blackhaw	X		X	X	12–16	Yes	Yes	White flowers, purple fruit.
	Crabapple (var.)	X	X	X		10–20	Yes	Yes	Many varieties, see nurserymen.
	Dogwood, red-osier	X		X	X	6–10	Yes	Yes	Good plant for borders and wildlife food.
	Gum, black		X	X		50–60	Yes	Yes	Brilliant scarlet color in fall.
	Hazelnut, American	X		X	X	6–8	Yes	Yes	Edible nuts (filbert).
	Highbush-Cranberry	X	X	X	X	6–10	Yes	Yes	Holds red fruit into winter.
	Locust, black		X	X	X	60–80	Yes	No	Clusters of white flowers.
	Mountain-ash		X	X		20–30	Yes	No	Orange to red fruit.
	Pine, red	X	X		X	70–80	Yes	No	Evergreen; long needles.
	Pine, white	X	X			100–120	Yes	No	Evergreen; blue-green needles.
	Serviceberry	X	X	X		15–20	Yes	Yes	White flower early in spring.
	Spruce, Norway	X	X			60–80	Yes	Yes	Evergreen; short needles.
	Tulip-poplar		X			100–120	Yes		State tree of Indiana; yellow, tuliplike flower.
	Wahoo, eastern	X	X	X		8–10	Yes	Yes	Red color in fall.
	Yew (var.)	X	X			10–15	Yes	Yes	Dark-green evergreen.
Shallow and moderately deep, well-drained and excessively drained, sloping to very steep soils that have a seasonal high water table at a depth of more than 6 feet: Berks, Colyer, Corydon, Fairmount, Gilpin, Rarden, Rockcastle, Trappist, Weikert.	Blackhaw	X		X	X	12–16	Yes	Yes	White flower, purple fruit.
	Dogwood, flowering		X	X	X	15–25	Yes	Yes	White flower, red fruit.
	Forsythia	X			X	8–10	Yes	No	Yellow flower.
	Gum, black		X	X		50–60	Yes	No	Brilliant scarlet color in fall.
	Hazelnut, American	X		X	X	6–8	Yes	Yes	Edible nuts (filbert).
	Honeylocust (thornless).		X		X	40–50	Yes	No	Thin foliage, yellow in color in fall.
	Indigobush	X			X	8–12	Yes	Yes	Purple flower.
	Oak, scarlet		X			40–50	Yes	No	Scarlet foliage in fall.
	Pine, Austrian	X	X		X	60–80	Yes	No	Evergreen; stiff needles.
	Pine, red	X	X		X	70–80	Yes	No	Evergreen; long needles.
	Pine, shortleaf		X		X	80–100	Yes	No	Evergreen; yellowish-green needles.
	Pine, Virginia	X	X	X	X	60–80	Yes	No	Evergreen; rapid growing and hardy.
	Plum, wild	X		X	X	10–15	Yes	No	Red color in fall.
	Russian-olive	X	X	X	X	15–20	Yes	No	Narrow, silver leaves.
	Sumac, smooth	X		X	X	10–15	Yes	No	Retains fruit well.
	Sumac, staghorn	X		X	X	10–15	Yes	No	Spreads from root sprouts.
	Virburnum, mapleleaf.	X		X	X	4–8	Yes	Yes	Snow-white flower.

TABLE 4.—*Soil interpretations for kinds of wildlife*

Series	Open-land wildlife	Woodland wildlife	Wetland wildlife
Avonburg	Well suited	Suited: somewhat poorly drained; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Suited: somewhat poorly drained; fair for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Bartle	Well suited	Suited: somewhat poorly drained; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Suited: somewhat poorly drained; fair for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Bedford	Well suited	Well suited	Unsuited: moderately well drained; very poor for wetland food and cover plants and for shallow-water developments and excavated ponds; fair for grain and seed crops.
Berks	Poorly suited: erosion hazard; very poor for seed and grain crops; fair for grasses and legumes.	Suited: erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: excessively drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Bonnie	Suited: poorly drained; poor for seed and grain crops; fair for grasses and legumes and for wild herbaceous upland plants.	Well suited	Well suited.
Cincinnati	Well suited where slopes are 2 to 12 percent. Suited where slopes are 12 to 18 percent erosion hazard; poor for seed and grain crops; fair for grasses and legumes.	Well suited where slopes are 2 to 12 percent. Suited where slopes are 12 to 18 percent erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained; very poor for wetland food and cover crops and for shallow water developments and excavated ponds; fair to poor for seed and grain crops.
Clermont	Suited: poorly drained; poor for seed and grain crops; fair for grasses and legumes, wild herbaceous upland plants, and hardwood woodland plants.	Suited: poorly drained; fair for grasses and legumes, wild herbaceous upland plants, and hardwood and coniferous woodland plants.	Well suited.
Colyer	Unsuited: erosion hazard; very poor for seed and grain crops and hardwood woodland plants; poor for grasses and legumes and wild herbaceous upland plants.	Unsuited: erosion hazard; poor for grasses and legumes, wild herbaceous upland plants, and conifers because of rapid growth and canopy closure.	Unsuited: excessively drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Corydon	Poorly suited: erosion hazard; very poor for seed and grain crops and grasses and legumes; fair for wild herbaceous upland plants and hardwood woodland plants.	Poorly suited: erosion hazard; very poor for grasses and legumes; fair for wild herbaceous upland plants, hardwood woodland plants, and coniferous woodland plants.	Unsuited: excessively drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Crider	Well suited	Well suited	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds; fair for seed and grain crops.
Fairmount	Poorly suited: erosion hazard; very poor for seed and grain crops and grasses and legumes; fair for wild herbaceous upland plants and hardwood woodland plants.	Poorly suited: erosion hazard; very poor for grasses and legumes; fair for wild herbaceous upland plants, hardwood woodland plants, and coniferous woodland plants.	Unsuited: excessively drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Gilpin	Suited: erosion hazard; very poor for seed and grain crops; fair for grasses and legumes.	Suited: erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds.

TABLE 4.—*Soil interpretations for kinds of wildlife*—Continued

Series	Open-land wildlife	Woodland wildlife	Wetland wildlife
Grayford	Well suited	Well suited	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds; fair for seed and grain crops.
Gullied land	Poorly suited: erosion hazard; very poor for seed and grain crops and for grasses and legumes; poor for wild herbaceous upland plants.	Poorly suited: erosion hazard; very poor for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Hagerstown	Well suited where slopes are 6 to 12 percent. Suited where slopes are 12 to 25 percent: erosion hazard; poor to very poor for grain and seed crops; fair for grasses and legumes.	Well suited where slopes are 6 to 12 percent. Suited where slopes are 12 to 25 percent: erosion hazard; fair for grasses and lepumes.	Unsuited: well drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Haymond	Well suited	Well suited	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds.
Henshaw	Well suited	Suited: somewhat poorly drained; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Suited: somewhat poorly drained; fair for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Hickory	Suited where slopes are 18 to 25 percent: erosion hazard; poor to very poor for grain and seed crops; fair for grasses and legumes.	Suited where slopes are 18 to 25 percent: erosion hazard; fair for grasses and legumes.	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds.
Hosmer	Well suited	Well suited	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds.
Huntington	Well suited	Well suited	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds.
Jennings	Well suited where slopes are 0 to 12 percent. Suited where slopes are 12 to 18 percent: erosion hazard; poor for seed and grain crops; fair for grasses and legumes.	Well suited where slopes are 0 to 12 percent. Suited where slopes are 12 to 18 percent: erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth rate and canopy closure.	Unsuited: well drained; very poor for wetland food and cover crops, for shallow water developments, and for excavated ponds; fair to poor for seed and grain crops.
Jennings, heavy subsoil variant.	Well suited where slopes are 0 to 12 percent. Suited where slopes are 12 to 18 percent: erosion hazard; poor for seed and grain crops; fair for grasses and legumes.	Well suited where slopes are 0 to 12 percent. Suited where slopes are 12 to 18 percent: erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained; very poor for wetland food and cover crops and for shallow water developments and for excavated ponds; fair to poor for seed and grain crops.
Johnsburg	Well suited	Suited: somewhat poorly drained; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Suited: somewhat poorly drained; fair for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Lindside	Well suited	Well suited	Poorly suited: moderately well drained; poor for wetland food and cover plants and for shallow water developments and excavated ponds.

TABLE 4.—*Soils interpretations for kinds of wildlife*—Continued

Series	Open-land wildlife	Woodland wildlife	Wetland wildlife
Markland	Suited: clayey material; fair or poor for seed and grain crops; fair for grasses and for legumes and wild herbaceous upland plants.	Suited: clayey material; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds; fair to poor for seed and grain crops.
Montgomery	Poorly suited: very poorly drained; very poor for seed and grain crops; poor for grasses and legumes and wild herbaceous upland plants.	Well suited	Suited: clayey material; poor for wetland food and cover plants; good for shallow water developments and excavated ponds; very poor for grain and seed crops.
Newark	Well suited	Suited: somewhat poorly drained; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Suited: somewhat poorly drained; fair for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Pekin	Well suited	Well suited	Poorly suited or unsuited: moderately well drained; very poor for wetland food and cover plants and for shallow water developments; poor for excavated ponds.
Pope	Well suited	Well suited	Unsuited: well drained; very poor for shallow water developments and excavated ponds; fair for seed and grain crops.
Rarden	Suited: erosion hazard; very poor for seed and grain crops; fair for grasses and legumes.	Suited: erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds.
Rockcastle	Unsuited: erosion hazard; very poor for seed and grain crops and hardwood woodland plants; poor for grasses and legumes and wild herbaceous upland plants.	Unsuited: erosion hazard; poor for grasses and legumes and for wild herbaceous upland plants; very poor for hardwood plants and conifers because of rapid growth and canopy closure.	Unsuited: excessively drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Rossmoyne	Well suited	Well suited	Poorly suited or unsuited. Where slopes are 0 to 2 percent: moderately well drained; poor for wetland food and cover crops and for shallow water developments and excavated ponds. Where slopes are 2 to 6 percent: very poor for wetland food and cover crops and and for shallow water developments; poor for excavated ponds.
Trappist	Suited: erosion hazard; very poor for seed and grain crops; fair for grasses and legumes.	Suited: erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Uniontown	Well suited	Well suited	Unsuited: moderately well drained and well drained; very poor for wetland food and cover crops and for shallow water developments and excavated ponds.
Wakeland	Well suited	Suited: somewhat poorly drained; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Suited: somewhat poorly drained; fair for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.

TABLE 4.—*Soil interpretations for kinds of wildlife*—Continued

Series	Open-land wildlife	Woodland wildlife	Wetland wildlife
Weikert	Unsuited: erosion hazard; very poor for seed and grain crops and hardwood woodland plants; poor for grasses and legumes and wild herbaceous upland plants.	Unsuited: erosion hazard; poor for grasses and legumes and wild herbaceous upland plants; very poor for hardwood woodland plants and for conifers because of rapid growth and canopy closure.	Unsuited: excessively drained; very poor for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Weinbach	Well suited	Suited: somewhat poorly drained; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Suited: somewhat poorly drained; fair for wetland food and cover plants, for shallow water developments and excavated ponds, and for seed and grain crops.
Wheeling	Well suited	Well suited	Unsuited: well drained; very poor for wetland food and cover plants and for shallow water developments and excavated ponds.
Wilbur	Well suited	Well suited	Poorly suited: moderately well drained; poor for wetland food and cover crops and for shallow water developments and excavated ponds.
Zanesville	Well suited where slopes are 2 to 12 percent. Suited where slopes are 12 to 18 percent: erosion hazard; poor for seed and grain crops; fair for grasses and legumes.	Well suited where slopes are 2 to 12 percent. Suited where slopes are 12 to 18 percent: erosion hazard; fair for grasses and legumes; poor for conifers because of rapid growth and canopy closure.	Unsuited: well drained to moderately well drained; very poor for wetland food and cover crops and for shallow water developments and excavated ponds.
Zipp	Poorly suited: very poorly drained; poor for seed and grain crops, grasses and legumes, and wild herbaceous upland plants.	Well suited	Suited: very poorly drained; clayey material; poor for wetland food and cover plants; very poor for seed and grain crops.

A rating of *unsuited* means that it is very questionable whether habitats can be created, improved, or maintained, and that it is generally impractical under prevailing conditions.

Recreation

The landscape and resources of the survey area and its location relative to centers of population make it feasible to develop some recreational enterprises that can produce income. The most likely enterprises include hunting areas, shooting preserves, improved picnic areas, fishing waters, and water sports. Several recreational facilities have been established and are in use. One of these is the Clark State Forest in Clark County.

Watershed development in upland areas offers a potential for the impoundment of multipurpose bodies of water of different sizes. Well-drained soils in upland areas are well suited for use as picnic grounds, intensive play areas, and tent and camping trailer sites, and for cottages and utility buildings. The Ohio River offers opportunities for boating, water skiing, and swimming.

In table 5 the soils are rated according to their limitations for developing six kinds of recreational facilities. These are cottages and utility buildings; tent and camping trailer sites; picnic grounds, parks, and extensive play areas; playgrounds, athletic fields, and intensive play areas; trails and paths; and golf fairways.

Septic tank filter fields for sewage disposal was not a consideration in rating the soils for cottages and utility buildings. See table 8 in the engineering section of the survey for this information.

The ratings used in table 5 are slight, moderate, and severe. For a rating other than slight, the degree of limitation of the soil for developing a specific recreational facility is also given.

A rating of *slight* means the facility is easily created, improved, or maintained. There are few or no limitations that affect design or management. A *moderate* limitation means the facility usually can be created, improved, or maintained, but there are moderate soil limitations that affect design and management. A rating of severe means the practicability of establishing the facility is questionable. Extreme measures are needed to overcome the limitation, and use is generally unsound or not practical.

TABLE 5.—*Limitations for recreational uses*

[Pits (Ps) is not included, because it is too variable to be rated]

Soil series and map symbols	Cottages and utility buildings	Tent and camping trailer sites	Picnic grounds, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Trails and paths	Golf fairways
Avonburg: AvA, AvB.	Moderate: poorly drained.	Moderate: somewhat poorly drained; slow permeability; wet and soft after rains.	Moderate: somewhat poorly drained; wet and soft after rains.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Bartle: Ba	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability; wet and soft after rains.	Moderate: somewhat poorly drained; wet and soft after rains.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Bedford: BdA, BdB.	Slight	Moderate: wet and soft after rains; very slow permeability.	Moderate: wet and soft after rains.	Moderate: very slow permeability.	Slight	Slight.
Berks: BeF	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.
Bonnie: Bo	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.
Cincinnati: CcB2, CcC2, CcC3.	Slight for CcB2: 2 to 6 percent slopes. Moderate for CcC2 and CcC3: 6 to 12 percent slopes.	Moderate: 2 to 12 percent slopes; slow permeability; wet and soft after rains.	Moderate: 2 to 12 percent slopes; wet and soft after rains.	Moderate for CcB2: 2 to 6 percent slopes; slow permeability. Severe for CcC2 and CcC3: 6 to 12 percent slopes.	Slight	Slight for CcB2: 2 to 6 percent slopes. Moderate for CcC2 and CcC3: 6 to 12 percent slopes.
CcD2, CcD3	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Clermont: Ce	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.
Colyer: ChF	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.	Severe: 18 to 35 percent slopes.
Corydon: CoE, CoG.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.
Crider: CrA, CrB2, CrB3.	Slight	Moderate: moderately slow permeability; wet and soft after rains.	Moderate: wet and soft after rains.	Moderate: 0 to 6 percent slopes; moderately slow permeability.	Slight	Slight.
CrC2, CrC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes; moderately slow permeability; wet and soft after rains.	Moderate: 6 to 12 percent slopes; wet and soft after rains.	Moderate: 6 to 12 percent slopes; moderately slow permeability.	Slight	Moderate: 6 to 12 percent slopes.
CrD2, CrD3	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.

TABLE 5.—*Limitations for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camping trailer sites	Picnic grounds, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Trails and paths	Golf fairways
Fairmont: FaE, FcG.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.	Severe: 12 to 70 percent slopes.
Gilpin:						
GlC2, GlC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.
GlD2, GlD3, GlE2.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.
Grayford:						
GrA, GrB2, GrC2, GrC3.	Slight for GrA and GrB2: 0 to 6 percent slopes. Moderate for GrC2 and GrC3: 6 to 12 percent slopes.	Moderate: 0 to 12 percent slopes; moderately slow permeability; wet and soft after rains.	Moderate: 0 to to 12 percent slopes; wet and soft after rains.	Moderate for GrA and GrB2: 0 to 6 percent slopes; moderately slow permeability. Severe for GrC2 and GrC3: 6 to 12 percent slopes.	Slight	Slight for GrA and GrB2: 0 to 6 percent slopes. Moderate for GrC2 and GrC3: 6 to 12 percent slopes.
GrD2, GrD3, GrE2.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Moderate: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.
Gullied land: Gu	Severe: erosion hazard.	Severe: erosion hazard.	Severe: erosion hazard.	Severe: erosion hazard.	Severe: erosion hazard.	Severe: erosion hazard.
Hagerstown:						
HaC2, HcC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes; slow permeability; wet, soft, and commonly sticky after rains.	Moderate: 6 to 12 percent slopes; wet, soft, and commonly sticky after rains.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
HaD2, HaE2, HcD3, HcE3.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Moderate: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.
Haymond: Hd	Severe: subject to flooding.	Moderate: wet and soft after rains.	Moderate: wet and soft after rains.	Severe: subject to flooding.	Slight	Slight.
Henshaw: HeA	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; moderately slow permeability; wet and soft after rains.	Moderate: somewhat poorly drained; wet and soft after rains.	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Hickory: HkE2	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Moderate: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.

TABLE 5.—*Limitations for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camping trailer sites	Picnic grounds, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Trails and paths	Golf fairways
Hosmer:						
HoA, HoB2, HoC2, HoC3.	Slight for HoA and HoB2: 0 to 6 percent slopes. Moderate for HoC2 and HoC3: 6 to 12 percent slopes.	Moderate: 0 to 12 percent slopes; slow permeability; wet and soft after rains.	Moderate: 0 to 12 percent slopes; wet and soft after rains.	Moderate for HoA and HoB2: 0 to 6 percent slopes. Severe for HoC2 and HoC3: 6 to 12 percent slopes.	Slight	Slight for HoA and HoB2: 0 to 6 percent slopes. Moderate for HoC2 and HoC3: 6 to 12 percent slopes.
HoD2	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Huntington: Hu	Severe: subject to flooding.	Moderate: wet and soft after rains.	Moderate: wet and soft after rains.	Severe: subject to flooding.	Slight	Slight.
Jennings:						
JeA, JeB2, JhB2, JhC2, JhC3.	Slight for JeA, JeB2 and JhB2: 0 to 6 percent slopes. Moderate for JhC2 and JhC3: 6 to 12 percent slopes.	Moderate: 0 to 12 percent slopes; slow permeability; wet and soft after rains.	Moderate: 0 to 12 percent slopes; wet and soft after rains.	Slight for JeA, JeB2, and JhB2: 0 to 6 percent slopes. Severe for JhC2 and JhC3: 6 to 12 percent slopes.	Slight	Slight for JeA, JeB2, and JhB2: 0 to 6 percent slopes. Moderate for JhC2 and JhC3: 6 to 12 percent slopes.
JhD2	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Johnsburg: JoA	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; very slow permeability; wet and soft after rains.	Moderate: somewhat poorly drained; wet and soft after rains.	Moderate: somewhat poorly drained; very slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Lindside: Ln	Severe: subject to flooding.	Moderate: wet and soft after rains.	Moderate: wet and soft after rains.	Severe: subject to flooding.	Slight	Slight.
Markland:						
MaC2	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes; slow permeability; wet, soft, and sticky after rains.	Moderate: 6 to 12 percent slopes; wet, soft, and sticky after rains.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
MaD2, MaE2	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Moderate: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.
Montgomery: Mo.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Newark: Ne	Severe: subject to flooding.	Moderate: somewhat poorly drained; wet and soft after rains.	Moderate: somewhat poorly drained; wet and soft after rains.	Severe: subject to flooding.	Slight	Slight.

TABLE 5.—*Limitations for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camping trailer sites	Picnic grounds, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Trails and paths	Golf fairways
Pekin: PeB2	Slight	Moderate: slow permeability; wet and soft after rains.	Moderate: wetland; soft after rains.	Moderate: slow permeability.	Slight	Slight.
Pope: Pt	Severe: subject to flooding.	Slight	Slight	Severe: subject to flooding.	Slight	Slight.
Rarden:						
RdC2, ReC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
RdD2, ReD3	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Rockcastle: RkF	Severe: 18 to 55 percent slopes.	Severe: 18 to 55 percent slopes.	Severe: 18 to 55 percent slopes.	Severe: 18 to 55 percent slopes.	Severe: 18 to 55 percent slopes.	Severe: 18 to 55 percent slopes.
Rossmoyne: RoA, RoB2, RoB3.	Slight	Moderate: slow permeability; wet and soft after rains.	Moderate: wet and soft after rains.	Moderate: slow permeability.	Slight	Slight.
Trappist:						
TrC2, TrC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
TrD2, TrD3	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Uniontown:						
UnB2	Slight	Moderate: 2 to 6 percent slopes; moderately slow permeability; wet and soft after rains.	Moderate: 2 to 6 percent slopes; wet and soft after rains.	Moderate: 2 to 6 percent slopes; moderately slow permeability.	Slight	Slight: 2 to 6 percent slopes.
UnC2	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes; moderately slow permeability; wet and soft after rains.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
Wakeland: Wa	Severe: subject to flooding.	Moderate: somewhat poorly drained; wet and soft after rains.	Moderate: somewhat poorly drained; wet and soft after rains.	Severe: subject to flooding.	Slight	Slight.
Weikert: WcG	Severe: 35 to 90 percent slopes.	Severe: 35 to 90 percent slopes.	Severe: 35 to 90 percent slopes.	Severe: 35 to 90 percent slopes.	Severe: 35 to 90 percent slopes.	Severe: 35 to 90 percent slopes.
Weinbach: WeA	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability; wet and soft after rains.	Moderate: somewhat poorly drained; wet and soft after rains.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.

TABLE 5.—*Limitations for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camping trailer sites	Picnic grounds, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Trails and paths	Golf fairways
Wheeling:						
WhB2, WhC2, WIA, WIB2, WIC2.	Slight for WhB2, WIA, and WIB2: 0 to 6 percent slopes. Moderate for WhC2 and WIC2: 6 to 12 percent slopes.	Moderate: 0 to 12 percent slopes; wet and soft after rains.	Moderate: 0 to 12 percent slopes; wet and soft after rains.	Slight for WIA: 0 to 2 percent slopes. Moderate for WhB2 and WIB2: 2 to 6 percent slopes. Severe for WhC2 and WIC2: 6 to 12 percent slopes.	Slight	Slight for WhB2, WIA, and WIB2: 0 to 6 percent slopes. Moderate for WhC2 and WIC2: 6 to 12 percent slopes.
WID2	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Wilbur: Wm	Severe: subject to flooding.	Moderate: wet and soft after rains.	Moderate: wet and soft after rains.	Severe: subject to flooding.	Slight	Slight.
Zanesville:						
ZaB2, ZaB3, ZaC2, ZaC3.	Slight for ZaB2 and ZaB3: 2 to 6 percent slopes. Moderate for ZaC2 and ZaC3: 6 to 12 percent slopes.	Moderate: 2 to 12 percent slopes; slow permeability; wet and soft after rains.	Moderate: 2 to 12 percent slopes; wet and soft after rains.	Moderate for ZaB2 and ZaB3: 2 to 6 percent slopes; slow permeability. Severe for ZaC2 and ZaC3: 6 to 12 percent slopes.	Slight	Slight for ZaB2 and ZaB3: 2 to 6 percent slopes. Moderate for ZaC2 and ZaC3: 6 to 12 percent slopes.
ZaD2, ZaD3	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Zipp: Zp	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.

Engineering Uses of the Soils

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be used in—

1. Selecting potential residential, industrial, commercial, and recreational areas.
2. Evaluating alternate routes for roads, highways, pipelines, and underground cables.
3. Seeking sources of gravel, sand, or clay.
4. Planning farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlating performance of structures already built with the properties of the kinds of soil on which they are built for the purpose of predicting the performance of structures on the same or similar kinds of soil in other locations.
6. Predicting the suitability of soils for the cross-country movement of vehicles and construction equipment.
7. Developing preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 6, 7, and 8, which show, respectively, results of engineering laboratory tests on soil samples, several estimated soil properties significant to engineering, and interpretations for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 7 and 8. It also can be used to make other useful maps.

TABLE 6.—*Engineering*

[Tests performed by the Purdue University in cooperation with the Indiana State Highway Department and U. S. Department of Officials

Soil name and location	Parent material	Report No. S62–Ind.	Depth	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
			Inches	*Lb. per cu. ft.*	*Percent*
Avonburg silt loam:					
2,250 feet NE. of SW. corner and 125 feet NW. of S. boundary of Clark Grant 245 (modal).	Loess over Illinoian till.	10–5–1	0–10	112	16
		10–5–2	18–41	110	16
		10–5–3	64–76	114	15
1 mile N. of Old Watson, Grant 37, W¼, 280 feet W. of railroad and 10 feet NW. of lane (shallower to black shale than modal).	Shallow loess over till underlain by weathered acid shale.	10–1–1	0–7	102	20
		10–1–2	18–35	110	16
		10–1–3	35–50	112	15
Clermont silt loam:					
3,000 feet N. of SW. corner and 2,125 feet NE. of W. boundary of Clark Grant 263 (modal).	Loess over Illinoian till.	10–4–1	8–21	113	15
		10–4–2	32–50	110	15
		10–4–3	66–74	115	14
Crider silt loam:					
1.25 miles E. of Sellersburg; N¼ of Grant 91, 200 feet S. of gravel road (modal).	Loess over weathered, chert-free limestone.	10–7–1	0–8	98	22
		10–7–2	20–28	106	18
		10–7–3	36–52	93	25
2.5 miles W. of Selor, S¼ of Grant 124, 470 feet NW. of Indiana Highway 62 and 50 feet W. of road (deep to bedrock).	Loess over weathered, chert-free limestone.	10–8–1	0–4	98	22
		10–8–2	23–38	104	19
		10–8–3	53–70	104	19
Henshaw silt loam:					
1,000 feet SE. of NW. corner and 375 feet NE. of W. boundary of Clark Grant 46 (modal).	Loess over lacustrine clay and silt.	10–2–1	0–8	98	22
		10–2–2	14–34	105	19
		10–2–3	58–68	103	21
Markland silt loam:					
1,000 feet SE. of NW. corner and 500 feet of NE. of W. boundary of Clark Grant 46 (modal).	Thin loess over lacustrine clay and silty clay.	10–3–1	2–7	99	21
		10–3–2	12–26	96	23
		10–3–3	26–36	98	22
Trappist silt loam:					
2.5 miles SE. of Henryville, N¼ of Grant 207, 200 feet NE. of road corner and 20 feet SE. of road (modal).	Loess over till underlain by weathered shale.	10–6–1	0–5	101	21
		10–6–2	20–31	103	20
		10–6–3	36–42	101	21

[1] AASHO Designation T 99–57, Method A, (*1*).

[2] Mechanical analyses according to the AASHO Designation T 88–57(*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used

test data

Commerce, Bureau of Public Roads, in accordance with standard procedures of the American Association of State Highway (AASHO)]

Mechanical analysis [2]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—						AASHO [3]	Unified [4]
3/8-inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
-------	100	99	93	73	67	53	26	15	25	(5)	A-4(8)	ML
-------	100	99	94	80	76	62	37	28	30	12	A-6(9)	CL
100	99	98	95	83	78	63	40	27	30	15	A-6(10)	CL
-------	100	99	97	93	90	70	37	25	31	9	A-4(8)	ML-CL
-------	-------	100	98	95	93	79	53	36	41	21	A-7-6(13)	CL
-------	-------	100	97	95	92	77	49	35	41	22	A-7-6(13)	CL
-------	100	99	95	78	76	59	33	16	24	4	A-4(8)	ML-CL
-------	100	99	95	80	77	64	40	26	32	16	A-6(10)	CL
100	99	98	95	77	73	60	40	29	29	14	A-6(10)	CL
-------	-------	100	99	95	84	53	29	12	38	14	A-6(10)	ML-CL
-------	-------	100	97	93	90	77	52	37	40	22	A-6(13)	CL
-------	-------	100	99	98	97	91	77	66	70	45	A-7-6(20)	CH
-------	-------	100	96	84	81	63	31	14	31	(5)	A-4(8)	ML
-------	-------	100	99	97	87	73	54	39	45	27	A-7-6(16)	CL
100	99	99	93	93	83	67	51	35	42	21	A-7-5(13)	CL
-------	-------	100	93	85	79	56	35	16	34	12	A-6(9)	ML-CL
-------	-------	-------	100	95	91	76	56	42	28	27	A-7-6(16)	CL
-------	-------	100	99	97	96	89	69	43	43	22	A-7-6(13)	CL
-------	-------	100	99	96	94	75	47	29	37	13	A-6(9)	ML-CL
-------	-------	-------	100	98	98	96	80	56	62	36	A-7-6(20)	CH
100	99	99	99	99	98	92	74	51	51	27	A-7-6(17)	CH
-------	100	99	98	93	89	66	35	17	31	6	A-4(8)	ML
-------	100	99	93	89	88	80	65	47	47	25	A-7-6(15)	CL
-------	100	98	96	95	94	89	71	53	49	19	A-7-5(13)	ML

in this table are not suitable for use in naming textural classes of soil.

[3] Based on AASHO Designation M 145-49 (*1*).

[4] Based on the Unified Soil Classification System (*8*). Soil Conservation Service and Bureau of Public Roads have agreed that all soils having plasticity indexes within 2 points from A-line are to be given a classification. ML-CL is an example of such a classification

[5] Nonplastic.

453-702—74——6

TABLE 7.—*Estimated*

[Gullied land (Gu) and Pits (Ps) are not included, because they are too variable

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Avonburg: AvA, AvB	5–10	[1] 1–3	0–24	Silt loam	ML or CL	A–4 or A–6
			24–64	Heavy silt loam and light clay loam.	CL or CH	A–6 or A–7
			64–72	Loam	CL	A–6
Bartle: Ba	6–10	[1] 1–3	0–22	Silt loam	ML or CL	A–4
			22–67	Silty clay loam	CL	A–6
			67–72	Thin layers of silty clay loam, silt loam, loam, and fine loam.	ML or CL	A–4
Bedford: BdA, BdB	5–10	3–6	0–25	Silt loam	ML or CL	A–4
			25–41	Silty clay loam	CL	A–6
			41–56	Silty clay loam	CL	A–7
			56–72	Clay	CH	A–7
Berks: BeF	20–36	6	0–10	Channery silt loam	ML	A–4
			10–28	Channery silt loam	GM	A–2
			28	Sandstone.		
Bonnie: Bo	5–10	[3] 0–1	0–40	Silt loam	ML or CL	A–4 or A–6
			40–50	Silty clay loam	ML or CL	A–6
			50–60	Silt loam	ML or CL	A–4 or A–6
Cincinnati: CcB2, CcC2, CcC3, CcD2, CcD3.	6–10	>6	0–7	Silt loam	ML or CL	A–4
			7–22	Silty clay loam	CL or CH	A–7
			22–55	Silty clay loam	CL or CH	A–7
			55–72	Clay loam	CL or CH	A–6 or A–7
Clermont: Ce	6–10	[1] 0–1	0–32	Silt loam	ML or CL	A–4 or A–6
			32–66	Silt loam	CL	A–6
			66–72	Gritty silt loam	CL	A–6
Colyer: ChF	⅔–1⅔	>6	0–16	Shaly silt loam and heavy silty clay loam.	ML	A–4
			16	Shale sandstone.		
Corydon: CoE, CoG	⅚–1⅔	>6	0–4	Stony silt loam	ML or CL	A–4 or A–6
			4–18	Silty clay loam and silty clay.	CL or CH	A–7
			18	Limestone.		
Crider: CrA, CrB2, CrB3, CrC2, CrC3, CrD2, CrD3.	4–6	>6	0–15	Silt loam	ML or CL	A–4
			15–36	Silty clay loam	CL or CH	A–4 or A–6
			36–65	Clay	CH	A–7
Fairmount: FaE, FcG	⅚–1⅔	>6	0–7	Silty clay loam	CL or CH	A–7
			7–19	Silty clay and clay	CL or CH	A–7
			19	Limestone.		
Gilpin: GlC2, GlC3, GlD2, GlD3, GlE2.	1⅔–3	>6	0–11	Silt loam	ML or CL	A–4 or A–6
			11–30	Silt loam and gritty silty clay loam.	CL	A–6
			30	Sandstone.		
Grayford: GrA, GrB2, GrC2, GrC3, GrD2, GrD3, GrE2.	5–8	>6	0–16	Silt loom	ML or CL	A–4 or A–6
			16–38	Silty clay loam	CL or CH	A–7
			38–60	Silt loam	ML or CL	A–4 or A–6
Hagerstown: HaC2, HaD2, HaE2, HcC3, HcD3, HcE3.	3½–5	>6	0–9	Silt loam	ML or CL	A–4
			9–16	Silty clay loam	CL or CH	A–7
			16–50	Silty clay to clay	CH	A–7
Haymond: Hd	4–7	>6	0–60	Silt loam	ML or CL	A–4

See footnotes at end of table.

engineering properties

to be rated; the symbol < means less than; the symbol > means more than]

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH value*		
100	90–100	85–95	0. 63–2. 00	0. 17–0. 20	5. 1–7. 3	High	Low.
100	90–100	85–95	0. 06–0. 20	[2] 0. 06–0. 08	4. 5–5. 0	High	Low.
100	90–95	80–90	0. 20–0. 63	[2] 0. 06–0. 08	5. 1–5. 5	High	Low.
95–100	90–95	70–80	0. 63–2. 00	0. 17–0. 20	5. 0–7. 3	High	Low.
100	95–100	80–90	0. 06–0. 20	[2] 0. 06–0. 08	4. 5–5. 0	Moderate	Low.
100	90–100	75–85	0. 20–0. 63	[2] 0. 19–0. 2	4. 5–5. 6	Moderate	Low.
95–100	95–100	90–95	0. 63–2. 00	0. 17–0. 19	5. 0–7. 3	Moderate to high	Low to moderate.
95–100	95–100	85–95	0. 20–0. 63	[2] 0. 06–0. 08	4. 5–5. 5	Moderate	Moderate.
95–100	90–95	80–90	0. 06–0. 20	[2] 0. 18–0. 20	4. 5–5. 0	Moderate	Moderate.
100	95–100	75–95	<0. 06	[2] 0. 08–0. 10	4. 5–5. 0	Moderate	Moderate.
70–85	65–80	60–75	0. 63–2. 00	0. 08–0. 12	4. 5–5. 0	High	Low.
35–50	30–45	25–35	0. 63–2. 00	0. 08–0. 12	4. 5–5. 0	High	Low.
100	95–100	75–95	0. 63–2. 00	0. 17–0. 20	5. 1–6. 5	High	Low.
100	95–100	85–95	0. 06–2. 00	0. 19–0. 21	5. 1–5. 5	Moderate	Moderate.
100	95–100	70–85	0. 20–2. 00	0. 17–0. 20	5. 1–5. 5	Moderate	Low.
100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	6. 6–7. 3	Moderate to high	Low.
100	90–95	80–90	0. 63–2. 00	0. 17–0. 20	4. 5–6. 5	Low	Low to moderate.
100	90–95	80–90	0. 06–0. 20	[2] 0. 06–0. 08	4. 5–5. 5	Low	Low to moderate.
100	90–95	85–95	0. 63–2. 00	[2] 0. 14–0. 16	5. 1–5. 5	Low	Moderate to high.
100	90–100	85–95	0. 63–2. 00	0. 17–0. 20	4. 5–7. 3	High	Low.
100	90–100	85–95	<0. 06	[2] 0. 06–0. 08	5. 1–5. 5	High	Low.
100	85–95	80–90	0. 63–2. 00	[2] 0. 20–0. 22	5. 6–6. 0	High	Low.
70–85	65–80	60–75	0. 63–2. 00	0. 08–0. 12	4. 5–5. 5	High	Low.
95–100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	6. 6–7. 3	Low	Low.
100	90–100	85–95	0. 20–0. 63	0. 19–0. 21	6. 6–7. 3	Low	Moderate to high.
100	90–100	85–95	0. 63–2. 00	0. 17–0. 20	4. 5–7. 3	High	Low.
100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	6. 1–7. 3	Moderate to high	Low.
100	90–100	80–95	0. 20–0. 63	0. 19–0. 21	5. 6–6. 0	Moderate	Moderate.
100	95–100	85–95	0. 20–0. 63	0. 19–0. 21	6. 6–7. 3	Low	Moderate.
100	95–100	90–95	0. 20–0. 63	0. 19–0. 21	6. 6–8. 4	Low	High.
100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	5. 1–5. 5	Moderate	Low.
100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	5. 1–5. 5	Moderate	Low.
100	90–100	85–95	0. 63–2. 00	0. 17–0. 20	5. 6–6. 5	High	Low.
100	95–100	90–95	0. 20–0. 63	0. 19–0. 21	4. 5–5. 5	Moderate	Moderate.
100	90–100	85–95	0. 63–2. 00	0. 17–0. 20	4. 5–6. 0	High	Low.
95–100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	5. 6–6. 0	Moderate to high	Low.
100	90–100	80–90	0. 63–2. 00	0. 19–0. 21	5. 1–5. 5	Moderate	Moderate.
100	90–100	90–95	0. 06–0. 20	0. 19–0. 21	5. 1–6. 5	Moderate	Moderate.
100	95–100	90–100	0. 63–2. 00	0. 17–0. 20	6. 1–6. 5	Moderate	Low.

TABLE 7.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Henshaw: HeA	15–20	1–3	0–14	Silt loam	ML or CL	A-4 or A-6
			14–58	Silty clay loam	CL	A-6 or A-7
			58–72	Silty clay, silty clay loam, and silt.	ML or CL	A-4, A-6, A-7
Hickory: HkE2	3½–10	>6	0–10	Silt loam	ML or CL	A-4 or A-6
			10–48	Silty clay loam and clay loam.	CL or CH	A-7
			48–60	Loam	CL	A-6
Hosmer: HoA, HoB2, HoC2, HoC3, HoD2.	8–12	>6	0–29	Silt loam	ML or CL	A-4 or A-6
			29–60	Silt loam	ML or CL	A-4 or A-6
			60–72	Silt loam	ML or CL	A-4 or A-6
Huntington: Hu	5–10	>6	0–60	Silt loam	ML or CL	A-4 or A-6
Jennings: JeA, JeB2	4–6	>6	0–27	Silt loam	ML or CL	A-4
			27–50	Silt loam to light clay loam	CL or CH	A-6 or A-7
			50–60	Shaly clay loam	CL or CH	A-6 or A-7
Jennings, heavy subsoil variant: JhB2, JhC2, JhC3, JhD2.	3½–5	>6	0–25	Silt loam to light silty clay	ML	A-4
			25–35	Light silty clay loam	CL or CH	A-6 or A-7
			35–51	Light silty clay to clay	CH	A-7
Johnsburg: JoA	5–10	[1] 1–3	0–23	Silt loam	ML	A-4
			23–45	Silt loam and silty clay loam	CL or CH	A-6 or A-7
			45–62	Silty clay loam	CL or CH	A-6 or A-7
Lindside: Ln	5–10	>6	0–60	Silt loam to light silty clay loam.	ML	A-4
Markland: MaC2, MaD2, MaE2	15–20	>6	0–7	Silt loam	ML or CL	A-6
			7–26	Silty clay	CH	A-7
			26–60	Silty clay to clay	CH	A-7
Montgomery: Mo	15–20	[3] 0–1	0–72	Silty clay	CL or CH	A-7
Newark: Ne	5–10	1–3	0–60	Silt loam	ML	A-4
Pekin: PeB2	6–10	3–6	0–25	Silt loam	ML or CL	A-4 or A-6
			25–63	Silty clay loam	CL or CH	A-7
			63–70	Layers of silt loam, silty clay loam, and fine sand.	ML or CL	A-4 or A-6
Pope: Pt	3–6	>6	0–22	Silt loam	ML or CL	A-4 or A-6
			22–36	Gravelly loam	GM	A-1
			36	Loose gravel.		
Rarden: RdC2, RdD2, ReC3, ReD3	2½–3½	>6	0–9	Silt loam	ML or CL	A-4 or A-6
			9–34	Silty clay loam to clay	CL or CH	A-7
			34	Shale.		
Rockcastle: RkF	1¼–2½	>6	0–10	Silt loam and silty clay loam.	ML or CL	A-4 or A-6
			10–26	Silty clay	CL or CH	A-7
			26	Shale.		
Rossmoyne: RoA, RoB2, RoB3	6–10	3–6	0–24	Silt loam	ML or CL	A-4 or A-6
			24–58	Silt loam	ML or CL	A-4 or A-6
			58–72	Loam to clay loam	CL or CH	A-6
Trappist: TrC2, TrC3, TrD2, TrD3	2½–4½	>6	0–22	Silt loam to silty clay loam	CL or CH	A-6 or A-7
			22–39	Silty clay to clay	CL or CH	A-7
			39	Shale.		

See footnotes at end of table.

engineering properties—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH value*		
100	95–100	85–95	0.63–2.00	0.19–0.21	5.6–6.5	High	Low.
100	95–100	85–95	0.20–0.63	0.19–0.20	5.6–7.3	Moderate	Moderate.
100	95–100	90–95	0.20–0.63	0.19–0.21	[4]	Moderate	High.
100	90–100	85–95	0.63–2.00	0.17–0.20	5.6–6.0	Low	Low.
100	90–100	85–95	0.20–0.63	0.19–0.21	5.6–7.3	Low	Moderate.
100	90–100	80–90	0.63–2.00	0.17–0.20	[4]	Low	Low.
100	90–100	75–90	0.63–2.00	0.17–0.20	5.6–7.3	Moderate to high	Low.
100	90–100	75–90	0.06–0.20	[2] 0.06–0.08	5.1–5.5	Low	Low.
100	90–100	75–90	0.63–2.00	[2] 0.20–0.22	5.1–5.5	Low	Low.
100	90–100	85–95	0.63–2.00	0.17–0.20	6.6–7.3	Moderate	Low.
100	95–100	85–95	0.63–2.00	0.17–0.21	4.5–7.3	Moderate to high	Low.
100	90–100	85–95	0.06–0.20	[2] 0.06–0.08	<4.5	High	Low.
100	90–95	85–95	0.63–2.00	[2] 0.14–0.16	<4.5	Low	Moderate.
100	100	90–100	0.63–2.00	0.19–0.21	4.5–5.5	Moderate	Low.
100	90–100	85–95	0.06–0.20	[2] 0.06–0.08	4.5–5.0	Moderate	Low.
100	95–100	90–95	0.06–0.20	[2] 0.08–0.12	<4.5	Moderate	High.
95–100	95–100	85–95	0.63–2.00	0.17–0.20	4.5–5.5	High	Low.
100	90–100	85–95	<0.06	[2] 0.06–0.08	4.5–5.0	Moderate	Low.
100	95–100	85–95	0.63–2.00	[2] 0.18–0.20	5.1–5.5	Moderate	Low.
100	100	90–100	0.63–2.00	0.19–0.21	6.6–7.3	Moderate	Low.
95–100	95–100	90–95	0.63–2.00	0.17–0.20	5.6–6.0	High	Moderate.
95–100	95–100	90–95	0.06–0.20	0.19–0.21	6.6–7.8	Moderate	High.
95–100	95–100	90–95	0.06–0.20	0.19–0.21	[4]	Moderate	High.
100	95–100	90–100	<0.06	0.19–0.21	6.6–7.3	High	High.
100	100	85–95	0.63–2.00	0.19–0.20	6.6–7.3	Moderate to high	Low.
100	95–100	85–95	0.63–2.00	0.17–0.20	5.1–7.3	High	Low.
100	95–100	85–95	0.06–0.20	[2] 0.06–0.08	5.1–5.5	High	Low.
100	95–100	70–85	0.20–2.00	[2] 0.19–0.21	6.1–6.5	High	Low.
90–95	80–90	70–80	0.63–2.00	0.17–0.20	6.1–6.5	Low	Low.
35–45	25–35	15–25	2.00–6.30	0.04–0.07	5.1–5.5	Low	Low.
100	90–100	85–95	0.63–2.00	0.17–0.20	4.5–5.0	Moderate to high	Low.
100	95–100	90–100	0.06–0.20	0.19–0.21	4.5–5.5	Low	Moderate.
100	90–100	85–95	0.63–2.00	0.17–0.20	4.5–5.5	Low	Low.
100	95–100	90–95	0.06–0.20	0.19–0.21	5.1–5.5	Low	High.
100	95–100	85–95	0.63–2.00	0.17–0.20	5.1–5.5	High	Low.
100	95–100	85–95	0.06–0.20	[2] 0.06–0.08	4.5–5.0	Moderate	Low.
100	90–95	85–95	0.63–2.00	[2] 0.14–0.19	5.6–6.5	Low	Moderate.
100	95–100	85–95	0.63–2.00	0.19–0.21	4.5–5.0	High	Low.
100	95–100	80–90	0.06–0.20	0.19–0.21	4.5–5.0	Low	Moderate.

TABLE 7.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Uniontown: UnB2, UnC2	15–20	>6	0–12	Silt loam	ML or CL	A-4 or A-6
			12–29	Silty clay loam	CL	A-6
			29–60	Silt loam and silty clay loam	CL	A-6
Wakeland: Wa	5–7	1–3	0–60	Silt loam	ML	A-4
Weikert: WcG	⅔–1⅔	>6	0–18	Channery silt loam	GM	A-2
			18	Sandstone.		
Weinbach: WeA	7–10	[1] 1–3	0–28	Silt loam	ML or CL	A-4 or A-6
			28–55	Silt loam	CL	A-6
			55–65	Silt loam with pockets of very fine sand and coarse silt.	ML or CL	A-4 or A-6
Wheeling: WhB2, WhC2, WlA, WlB2, WlC2, WlD2.	7–10	>6	0–17	Silt loam	ML	A-4 or A-6
			17–31	Clay loam	CL	A-6
			31–67	Silt loam to fine sandy loam.	ML	A-4
Wilbur: Wm	5–7	3–6	0–60	Silt loam	ML	A-4
Zanesville: ZaB2, ZaB3, ZaC2, ZaC3, ZaD2, ZaD3.	3½–6	>6	0–26	Silt loam	ML or CL	A-4 or A-6
			26–40	Silt loam	ML or CL	A-4 or A-6
			40–52	Loam and silt loam	ML or CL	A-4 or A-6
			52	Sandstone shale.		
Zipp: Zp	15–20	[3] 0–1	0–70	Silty clay	CL or CH	A-7
			70–72	Clay, silty clay, and silt	CL or CH	A-7

[1] Perched water table.
[2] Fragipan limits water availability to the plants by restricting water movement and root penetration.

TABLE 8.—*Interpretations*

[Gullied land (Gu) and Pits (Ps) are not included,

Soil series and map symbols	Suitability as source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes, levees, and pond embankments
Avonburg: AvA, AvB.	Good: seasonal high water table.	Subsoil and substratum poor: fair stability and compaction; medium to high compressibility; fair shear strength; low shrink-swell potential; subject to frost heave; seasonal high water table.	Somewhat poorly drained; subject to frost heave; seasonal high water table.	Subsoil and substratum: fair stability and compaction; slow permeability when compacted; medium to high compressibility; good resistance to piping; low shrink-swell potential; fair shear strength.
Bartle: Ba	Good: seasonal high water table.	Subsoil and substratum poor: fair to poor stability and compaction; medium to high compressibility; low shrink-swell potential; subject to frost heave; seasonal high water table.	Somewhat poorly drained; subject to frost heave; seasonal high water table.	Subsoil and substratum: fair to poor stability and compaction; slow to moderate permeability when compacted; medium to high compressibility; good to poor resistance to piping; low shrink-swell potential; fair to poor shear strength.

engineering properties—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH value*		
100	90–100	85–95	0. 63–2. 00	0. 17–0. 20	5. 6–7. 3	High	Low to moderate.
100	95–100	90–95	0. 20–0. 63	0. 19–0. 21	5. 6–6. 0	Moderate	Moderate.
95–100	95–100	85–95	0. 20–0. 63	0. 17–0. 20	5. 6–7. 8	Moderate	Low.
100	95–100	95–100	0. 63–2. 00	0. 17–0. 20	6. 1–7. 3	High	Low.
35–50	30–45	25–35	0. 63–2. 00	0. 08–0. 12	4. 5–5. 5	High	Low.
100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	4. 5–7. 3	High	Low.
100	95–100	85–95	0. 06–0. 20	[2] 0. 06–0. 08	4. 5–5. 0	Moderate to high	Low.
95–100	85–100	75–90	0. 20–0. 63	[2] 0. 19–0. 21	5. 1–5. 5	Moderate to high	Low.
100	95–100	95–100	0. 63–2. 00	0. 17–0. 20	6. 1–7. 3	High	Low.
100	95–100	90–100	0. 63–2. 00	0. 19–0. 21	5. 1–5. 5	Moderate to high	Low.
100	95–100	85–95	0. 63–2. 00	0. 17–0. 21	5. 1–5. 5	High	Low.
100	95–100	95–100	0. 63–2. 00	0. 19–0. 21	6. 1–7. 3	Moderate	Low.
100	95–100	85–95	0. 63–2. 00	0. 17–0. 20	5. 1–7. 3	High	Low.
100	95–100	85–95	0. 06–0. 20	[2] 0. 06–0. 08	5. 1–5. 5	Moderate	Low.
100	95–100	90–100	0. 63–2. 00	[2] 0. 17–0. 22	4. 5–5. 5	Low	Low.
100	90–100	85–95	<0. 06	0. 19–0. 20	6. 6–7. 3	High	High.
100	90–100	85–95	<0. 06	0. 19–0. 20	([4])	High	High.

[3] Ponded.
[4] Calcareous.

of engineering properties

because they are too variable to be rated]

Soil features affecting—Continued					Soil limitations for septic tank filter fields
Pond reservoir areas	Agriculture drainage	Terrace and diversions	Grassed waterways	Foundations for low buildings	
Seasonal high water table; slow to very slow seepage in subsoil and moderately slow seepage in substratum.	Seasonal high water table; slowly permeable fragipan.	Slowly permeable fragipan at a depth of 22 to 30 inches.	Slowly permeable fragipan at depth of 22 to 30 inches.	Somewhat poorly drained; slow permeability; medium to high compressibility; seasonal high water table.	Severe: slow permeability; seasonal high water table.
Seasonal high water table; slow to moderately slow seepage.	Seasonal high water table; slowly permeable fragipan.	Nearly level	Slowly permeable fragipan at depth of 22 to 30 inches; nearly level.	Somewhat poorly drained; medium to high compressibility; fair to poor shear strength; seasonal high water table.	Severe: slow permeability; seasonal high water table.

TABLE 8.—*Interpretations*

Soil series and map symbols	Suitability as source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes, levees, and pond embankments
Bedford: BdA, BdB.	Fair: low organic-matter content; limited thickness.	Subsoil and substratum poor: fair to poor stability and compaction; medium to high compressibility; moderate shrink-swell potential; fair shear strength.	Subject to frost heave; cuts and fills needed; highly erodible when exposed in embankments; plastic material.	Subsoil and substratum: fair to poor stability and compaction; slow permeability when compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential; fair shear strength.
Berks: BeF	Poor: high in channery material; bedrock at depth of 20 to 36 inches.	Subsoil and substratum fair: bedrock at depth of 20 to 36 inches.	Bedrock at depth of 20 to 36 inches; cuts and fills needed.	Subsoil and substratum: fair stability and good compaction; moderate permeability; good to poor resistance to piping; low shrink-swell potential; fair shear strength.
Bonnie: Bo	Good: low in organic-matter content; seasonal high water table; subject to flooding.	Subsoil and substratum fair to poor: fair to poor compaction; medium compressibility; low to moderate shrink-swell potential; seasonal high water table; subject to flooding.	Poorly drained; subject to frost heave; subject to flooding; seasonal high water table.	Subsoil and substratum: fair to poor stability and compaction; slow to moderate permeability when compacted; medium compressibility; poor resistance to piping; low to moderate shrink-swell potential; fair to poor shear strength.
Cincinnati: CcB2, CcC2, CcC3, CcD2, CcD3.	Good	Subsoil and substratum fair to poor: fair stability and compaction; medium to high compressibility; fair shear strength; moderate shrink-swell potential; subject to frost heave.	Cuts and fills needed; highly erodible when exposed on embankments; subject to frost heave.	Subsoil and substratum; fair stability and compaction; slow permeability when compacted; medium to high compressibility; good to poor resistance to piping; moderate shrink-swell potential; fair shear strength.
Clermont: Ce	Good: seasonal high water table.	Subsoil and substratum poor: fair to poor stability and compaction; medium to high compressibility; low shrink-swell potential; seasonal high water table.	Poorly drained; subject to frost heave; seasonal high water table.	Subsoil and substratum: fair to poor stability and compaction; slow to moderate permeability when compacted; medium to high compressibility; good to poor resistance to piping; low shrink-swell potential; fair to poor shear strength.
Colyer: ChF	Poor: bedrock at depth of 8 to 20 inches.	Very poor: bedrock at depth of 8 to 20 inches.	Bedrock at depth of 8 to 20 inches; cuts and fills, needed.	Bedrock at depth of 8 to 20 inches
Corydon: CoE, CoG.	Poor: bedrock at depth of 10 to 20 inches.	Very poor: bedrock at depth of 10 to 20 inches.	Bedrock at depth of 10 to 20 inches; cuts and fills needed.	Bedrock at depth of 10 to 20 inches
Crider: CrA, CrB2, CrB3, CrC2, CrC3, CrD2, CrD3.	Good: limited thickness.	Subsoil and substratum poor: fair to poor stability and compaction; medium to high compressibility; moderate shrink-swell potential; poor shear strength.	Subject to frost heave: cuts and fills needed; highly erodible when exposed in embankments; plastic material.	Subsoil and substratum: fair to poor stability and compaction; slow permeability when compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential; poor shear strength.
Fairmount: FaE, FcG.	Poor: bedrock at depth of 10 to 20 inches.	Very poor: bedrock at depth of 10 to 20 inches.	Bedrock at depth of 10 to 20 inches; cuts and fills needed.	Bedrock at depth of 10 to 20 inches

of engineering properties—Continued

Soil features affecting—Continued					Soil limitations for septic tank filter fields
Pond reservoir areas	Agriculture drainage	Terrace and diversions	Grassed waterways	Foundations for low buildings	
Subject to seepage in underlying limestone bedrock.	Very slow permeability; moderately well drained.	Very slowly permeable fragipan at depth of 18 to 30 inches.	Very slowly permeable fragipan at depth of 18 to 30 inches.	Subsoil and substratum: fair shear strength; moderate shrink-swell potential; medium to high compressibility.	Severe: very slow permeability.
Moderate permeability; bedrock at depth of 20 to 36 inches.	Moderate permeability; excessively drained.	Channery; bedrock at depth of 20 to 36 inches; slopes of 18 to 35 percent.	Channery; bedrock at depth of 20 to 36 inches; slopes of 18 to 35 percent.	Medium compressibility; bedrock at depth of 20 to 36 inches; slopes of 18 to 35 percent.	Severe: bedrock at depth of 20 to 36 inches.
Seasonal high water; moderate seepage rate; subject to flooding.	Seasonal high water table, slow permeability; subject to flooding.	Nearly level; subject to flooding.	Nearly level------	Poorly drained; slow permeability; medium compressibility; subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table; poorly drained.
Moderately slow seepage rate in substratum.	Slow permeability; well drained.	Slow permeability; fragipan at depth of 18 to 30 inches.	Slow permeability; fragipan at depth of 18 to 30 inches.	Fair shear strength; medium to high compressibility; moderate shrink-swell potential.	Severe: slow permeability.
Nearly level------	Seasonal high water table; very slow permeability.	Nearly level------	Very slowly permeable fragipan at depth of 22 to 35 inches; nearly level.	Poorly drained; very slow permeability; medium to high compressibility; seasonal high water table.	Severe: very slow permeability; poorly drained; seasonal high water table.
Moderate permeability; bedrock at depth of 8 to 20 inches.	Moderate permeability; excessively drained.	Bedrock at depth of 8 to 20 inches.	Bedrock at depth of 8 to 20 inches; slopes of 18 to 35 percent.	Bedrock at depth of 8 to 20 inches; slopes of 18 to 35 percent.	Bedrock at depth of 8 to 20 inches; slopes of 18 to 35 percent.
Moderately slow permeability; bedrock at depth of 10 to 20 inches.	Moderately slow permeability; excessively drained.	Stony; bedrock at depth of 10 to 20 inches; slopes 12 to 70 percent.	Stony; bedrock at depth of 10 to 20 inches; slopes of 12 to 70 percent.	Stony; bedrock at depth of 10 to 20 inches; slopes of 12 to 70 percent.	Severe: stony; bedrock at depth of 10 to 20 inches; slopes of 12 to 70 percent.
Subject to seepage in underlying limestone bedrock.	Moderately slow permeability; well drained.	Slopes of 0 to 18 percent.	Slopes of 0 to 18 percent.	Moderate shrink-swell potential; medium to high compressibility.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 18 percent.
Moderately slow permeability; bedrock at depth of 10 to 20 inches.	Moderately slow permeability; excessively drained.	Stony; bedrock at depth of 10 to 20 inches; slopes of 12 to 70 percent.	Stony; bedrock at depth of 10 to 20 inches; slopes of 12 to 70 percent.	Stony; bedrock at depth of 10 to 20 inches; slopes of 12 to 70 percent.	Severe: stony; bedrock at depth of 10 to 20 inches; slopes of 12 to 70 percent.

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TABLE 8.—*Interpretations*

Soil series and map symbols	Suitability as source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes, levees, and pond embankments
Gilpin: GlC2, GlC3, GlD2, GlD3, GlE2.	Good: limited thickness.	Subsoil fair: fair stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave, bedrock at depth of 20 to 36 inches.	Bedrock at depth of 20 to 36 inches; cuts and fills needed; subject to frost heave.	Subsoil fair stability and compaction: slow to moderate permeability when compacted; medium compressibility; fair to poor resistance to piping; low shrink-swell potential; fair shear strength; bedrock at depth of 20 to 36 inches.
Grayford: GrA, GrB2, GrC2, GrC3, GrD2, GrD3, GrE2.	Good	Subsoil and substratum poor to very poor: fair to poor stability and compaction; high compressibility; low to moderate shrink-swell potential; poor shear strength.	Subject to frost heave; cuts and fills needed; highly erodible when exposed in embankments; plastic material.	Subsoil and substratum: fair to poor stability and compaction; slow permeability when compacted; high compressibility; good resistance to piping; low to moderate shrink-swell potential; poor shear strength.
Hagerstown: HaC2, HaD2, HaE2, HcC3, HcD3, HcE3.	Fair to poor: low organic-matter content; limited thickness.	Subsoil and substratum fair to good: fair to good stability and compaction; medium to high compressibility; moderate shrink-swell potential; fair shear strength.	Cuts and fills needed; highly erodible when exposed in embankments; plastic material.	Subsoil and substratum: fair to good stability and compaction; slow permeability when compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential; fair shear strength.
Haymond: Hd	Good: subject to flooding.	Subsoil and substratum fair: poor stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave and flooding.	Subject to flooding; subject to frost heave.	Subsoil and substratum: poor stability and compaction; moderate permeability when compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.
Henshaw: HeA	Good: seasonal high water table.	Subsoil and substratum poor: fair stability and compaction; medium compressibility; moderate shrink-swell potential; seasonal high water table.	Somewhat poorly drained; plastic material; subject to frost heave; seasonal high water table.	Subsoil and substratum: fair stability and compaction; medium compressiblity; slow permeability when compacted; moderate shrink-swell potential; good resistance to piping.
Hickory: HkE2	Good	Subsoil and substratum poor: fair to good stability and compaction; medium to high compressibility; fair shear strength; low to moderate shrink-swell potential; subject to frost heave.	Cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair to good stability and compaction; slow to moderate permeability when compacted; medium to high compressibility; good to poor resistance to piping; low to moderate shrink-swell potential; fair shear strength.
Hosmer: HoA HoB2, HoC2, HoC3, HoD2.	Good	Subsoil and substratum poor: fair to good stability and compaction; medium to high compressibility; fair shear strength; low shrink-swell potential; subject to frost heave.	Cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair to good stability and compaction; slow to moderate permeablity when compacted; medium to high compressibility; good to poor resistance to piping; low shrink-swell potential; fair shear strength.
Huntington: Hu	Good: subject to flooding.	Subsoil and substratum fair: fair stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave and flooding.	Subject to flooding; subject to frost heave.	Subsoil and substratum: fair stability and compaction; moderate to slow permeability when compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.

of engineering properties—Continued

Soil features affecting—Continued					Soil limitations for septic tank filter fields
Pond reservoir areas	Agriculture drainage	Terrace and diversions	Grassed waterways	Foundations for low buildings	
Moderate permeability; bedrock at depth of 20 to 36 inches; moderate seepage rate.	Moderate permeability; well drained.	Bedrock at depth of 20 to 36 inches; slopes of 6 to 25 percent.	Bedrock at depth of 20 to 36 inches; slopes of 6 to 25 percent.	Bedrock at depth of 20 to 36 inches; subject to sliding; fair shear strength; medium compressibility.	Severe: bedrock at depth of 20 to 36 inches.
Subject to seepage in underlying limestone bedrock.	Moderately slow permeability; well drained.	Slopes of 0 to 25 percent.	Soil features favorable; slopes of 0 to 25 percent; slopes subject to runoff and erosion.	Poor shear strength; low to high shrink-swell potential; high compressibility.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 18 percent.
Subject to seepage in underlying limestone bedrock.	Slow permeability; well drained.	Slopes of 6 to 25 percent.	Soil features favorable; slopes of 6 to 25 percent; subject to runoff and erosion.	Fair shear strength; moderate shrink-swell potential; medium to high compressibility.	Severe: slow permeability.
Nearly level; moderate permeability; subject to flooding.	Subject to flooding; moderate permeability; well drained.	Slopes of 0 to 2 percent; subject to flooding.	Slopes of 0 to 2 percent.	Subject to flooding; medium compressibility.	Severe: subject to flooding.
Seasonal high water table; moderate to moderately slow seepage.	Seasonal high water table; moderately slow permeability.	Slopes of 0 to 2 percent.	Slopes of 0 to 2 percent.	Seasonal high water table; moderate shrink-swell potential; medium compressibility; soft when wet.	Severe: moderately slow permeability; seasonal high water table.
Moderately slow permeability.	Moderately slow permeability; well drained.	Slopes of 18 to 25 percent.	Slopes of 18 to 25 percent.	Fair shear strength; low to moderate shrink-swell potential; medium to high compressibility.	Moderate: moderately slow permeability; slopes of 18 to 25 percent.
Moderate permeability in substratum.	Slow permeability; well drained.	Slowly permeable fragipan at depth of 18 to 30 inches.	Slowly permeable fragipan at depth of 18 to 30 inches.	Fair shear strength; medium to high compressibilty; low shrink-swell potential.	Severe: slow permeability.
Subject to flooding; moderate seepage rate.	Subject to flooding; moderate permeability; well drained.	Slopes of 0 to 2 percent; subject to flooding.	Slopes of 0 to 2 percent.	Subject to flooding; medidium compressibility.	Severe: subject to flooding.

TABLE 8.—*Interpretations*

Soil series and map symbols	Suitability as source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes, levees, and pond embankments
Jennings: JeA, JeB2.	Good: limited thickness.	Subsoil and substratum poor: fair to good stability and compaction; medium to high compressibility; fair shear strength; moderate shrink-swell potential; subject to frost heave.	Cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair to good stability and compaction; low to moderate premeability when compacted; medium to high compressibility; good to poor resistance to piping; moderate shrink-swell potential; fair shear strength.
Jennings, heavy subsoil variant: JhB2, JhC2, JhC3, JhD2.	Good: limited thickness.	Subsoil and substratum poor: fair to good stability and compaction; medium to high compressibility; fair shear strength; high shrink-swell potential; subject to frost heave.	Cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair to good stability and compaction; low to moderate permeability when compacted; medium to high compressibility; good to poor resistance to piping; high shrink-swell potential; fair shear strength.
Johnsburg: JoA	Good: seasonal high water table.	Subsoil and substratum poor: fair to good stability and compaction; medium to high compressibility; fair shear strength; low shrink-swell potential; subject to frost heave; seasonal high water table.	Somewhat poorly drained; subject to frost heave; seasonal high water table.	Subsoil and substratum: fair to good stability and compaction; slow permeability when compacted; medium to high compressibility; good resistance to piping; low shrink-swell potential; fair shear strength.
Lindside: Ln	Good: subject to flooding.	Subsoil and substratum fair: fair stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave and flooding.	Subject to flooding; subject to frost heave.	Subsoil and substratum: fair stability and compaction; moderate to slow permeabilty when compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.
Markland: MaC2, MaD2, MaE2.	Fair: low organic-matter content; limited thickness.	Subsoil and substratum very poor: fair to poor stability and compaction; high compressibility; high shrink-swell potential; poor shear strength.	Cuts and fills needed; plastic material.	Subsoil and substratum: fair to poor stability and compaction; slow permeability when compacted; high compressibility; good resistance to piping; high shrink-swell potential; poor shear strength.
Montgomery: Mo	Poor: clayey; seasonal high water table.	Subsoil and substratum poor: poor stability and compaction; high compressibility; high shrink-swell potential; poor shear strength; seasonal high water table.	Very poorly drained: plastic material; seasonal high water table.	Subsoil and substratum: poor stability and compaction; slow permeability when compacted; high compressibility; good resistance to piping; high shrink-swell potential; poor shear strength.
Newark: Ne	Good: subject to flooding; seasonal high water table.	Subsoil and substratum fair: fair stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave and flooding; seasonal high water table.	Subject to flooding; subject to frost heave; seasonal high water table.	Subsoil and substratum: fair stability and compaction; moderate permeability when compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.

of engineering properties—Continued

Soil features affecting—Continued					Soil limitations for septic tank filter fields
Pond reservoir areas	Agriculture drainage	Terrace and diversions	Grassed waterways	Foundations for low buildings	
Moderate permeability in substratum.	Slow permeability; well drained.	Slowly permeable fragipan at depth of 18 to 30 inches.	Slowly permeable fragipan at depth of 18 to 30 inches.	Fair shear strength; medium to high compressibility; moderate shrink-swell potential.	Severe: slow permeability.
Moderate permeability in substratum.	Slow permeability; well drained.	Slowly permeable fragipan at depth of 18 to to 30 inches.	Slowly permeable fragipan at depth of 18 to 30 inches.	Fair shear strength; medium to high compressibility; high shrink-swell potential.	Severe: slow permeability.
Nearly level	Seasonal high water table; very slowly permeable fragipan.	Slopes of 0 to 2 percent.	Very slowly permeable fragipan at depth of 22 to 30 inches; slopes of 0 to 2 percent.	Somewhat poorly drained; very slow permeability; low shrink-swell potential.	Severe: very slow permeability; seasonal high water table.
Subject to flooding; moderate seepage rate.	Subject to flooding; moderate permeability; moderately well drained.	Slopes of 0 to 2 percent; subject to flooding.	Slopes of 0 to 2 percent.	Subject to flooding; medium compressibility.	Severe: subject to flooding.
Slopes of 12 to 25 percent; dense clayey subsoil.	Slow permeability; well drained to moderately well drained.	Dense clayey subsoil; difficult to vegetate.	Clayey subsoil difficult to vegetate; erodes readily.	Poor shear strength; high shrink-swell potential; high compressibility.	Severe: slow permeability.
Seasonal high water table; slow seepage rate.	Very slow permeability; seasonal high water table.	Slopes of 0 to 2 percent; seasonal high water table.	Slopes of 0 to 2 percent; seasonal high water table.	Poor shear strength; high shrink-swell potential; high compressibility; very poorly drained; very slow permeability; seasonal high water table.	Severe: very slow permeability; seasonal high water table.
Nearly level; moderate permeability; seasonal high water table; subject to flooding; moderate seepage.	Subject to flooding; moderate permeability; somewhat poorly drained; seasonal high water table.	Slopes of 0 to 2 percent; subject to flooding.	Slopes of 0 to 2 percent.	Subject to flooding; seasonal high water table; medium compressibility.	Severe: subject to flooding.

TABLE 8.—*Interpretations*

Soil series and map symbols	Suitability as source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes, levees, and pond embankments
Pekin: PeB2	Good	Subsoil and substratum poor: fair stability and compaction; medium to high compressibility; fair shear strength; low shrink-swell potential; subject to frost heave.	Subject to frost heave.	Subsoil and substratum: fair stability and compaction; slow to moderate permeability when compacted; medium to high compressibility; good to poor resistance to piping; low shrink-swell potential; fair shear strength.
Pope: Pt	Good: subject to flooding.	Subsoil and substratum fair: poor stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave and flooding.	Subject to flooding; subject to frost heave.	Subsoil and substratum: poor stability and compaction; moderate permeability when compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.
Rarden: RdC2, RdD2, ReC3, ReD3.	Fair: low organic-matter content; shale at depth of 2 to 3½ feet.	Subsoil fair: poor stability and compaction; medium compressibility; moderate shrink-swell potential; fair shear strength; subject to frost heave; shale at depth of 2 to 3½ feet.	Shale at depth of 2 to 3½ feet; cuts and fills needed; subject to frost heave.	Subsoil: poor stability and compaction; slow permeability when compacted; medium compressibility; fair to poor resistance to piping; moderate shrink-swell potential; fair shear strength; shale at depth of 2 to 3½ feet.
Rockcastle: RkF	Poor: shale at depth of 15 to 30 inches.	Very poor: shale at depth of 15 to 30 inches.	Shale at depth of 15 to 30 inches; cuts and fills needed.	Shale at depth of 15 to 30 inches
Rossmoyne: RoA, RoB2, RoB3.	Good	Subsoil and substratum poor: fair to good stability and compaction; medium to high compressibility; fair shear strength; moderate shrink-swell potential; subject to frost heave.	Subject to frost heave; cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair to good stability and compaction; slow permeability when compacted; medium to high compressibility; good to poor resistance to piping; moderate shrink-swell potential; fair shear strength.
Trappist: TrC2, TrC3, TrD2, TrD3.	Fair: low in organic-matter content; shale at depth of 2½ to 4 feet.	Subsoil poor: fair stability and compaction; medium to high compressibility; moderate shrink-swell potential; fair shear strength; subject to frost heave; shale at depth of 2½ to 4 feet.	Shale at depth of of 2½ to 4 feet; cuts and fills needed; subject to frost heave.	Subsoil: fair stability and compaction; slow permeability when compacted; medium compresibility; fair to poor resistance to piping; moderate shrink-swell potential; fair shear strength; shale at depth of 2½ to 4 feet.
Uniontown: UnB2, UnC2.	Good	Subsoil and substratum poor: fair stability and compaction; medium compressibility; moderate shrink-swell potential.	Cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair stability and compaction; medium compressibility; slow to moderate permeability when compacted; poor resistance to piping; moderate shrink-swell potential.
Wakeland: Wa	Good: subject to flooding; seasonal high water table.	Subsoil and substratum fair: poor stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave and flooding; seasonal high water table.	Subject to flooding; subject to frost heave; seasonal high water table.	Subsoil and substratum: poor stability and compaction; moderate permeability when compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.

of engineering properties—Continued

Soil features affecting—Continued					Soil limitations for septic tank filter fields
Pond reservoir areas	Agriculture drainage	Terrace and diversions	Grassed waterways	Foundations for low buildings	
Moderately slow seepage in substratum.	Slow permeability; moderately well drained.	Slowly permeable fragipan at depth of 18 to 30 inches.	Slowly permeable fragipan at depth of 18 to 30 inches.	Fair shear strength; low shrink-swell potential; medium to high compressibility.	Severe: slow permeability.
Nearly level; moderate permeability; subject to flooding; moderate seepage.	Subject to flooding.	Slopes of 0 to 2 percent; subject to flooding.	Slopes of 0 to 2 percent.	Subject to flooding; medium compressibility.	Severe: subject to flooding.
Slow permeability; shale at depth of 2 to 3½ feet.	Slow permeability; well drained.	Shale at depth of 2 to 3½ feet.	Shale at depth of 2 to 3½ feet.	Shale at depth of 2 to 3½ feet; subject to sliding; fair shear strength.	Severe: shale at depth of 2 to 3½ feet.
Slow permeability; shale at depth of 15 to 30 inches.	Slow permeability; excessively drained.	Shale at depth of 15 to 30 inches.	Shale at depth of 15 to 30 inches.	Bedrock at depth of 15 to 30 inches; slopes of 18 to 55 percent.	Severe: bedrock at depth of 15 to 30 inches; slopes of 18 to 55 percent.
Moderately slow seepage in substratum.	Slow permeability; moderately well drained.	Slowly permeable fragipan at depth of 18 to 30 inches.	Slowly permeable fragipan at depth of 18 to 30 inches.	Fair shear strength; moderate shrink-swell potential; medium to high compressibility.	Severe: slow permeability.
Slow permeability; shale at depth of 2½ to 4 feet; moderately slow seepage; possible seepage in bedrock fractures.	Slow permeability; well drained.	Shale at depth of 2½ to 4 feet.	Shale at depth of 2½ to 4 feet.	Shale at depth of 2½ to 4 feet. subject to sliding; fair shear strength; medium to high compressibility; moderate shrink-swell potential.	Severe: shale at depth of 2½ to 4 feet.
Slopes of 2 to 12 percent.	Moderately slow permeability; well drained to moderately well drained.	Slopes of 2 to 12 percent.	Slopes of 2 to 12 percent.	Moderate shrink-swell potential; medium compressibility.	Severe: moderately slow permeability.
Moderate permeability; subject to flooding.	Subject to flooding; seasonal high water table.	Slopes of 0 to 2 percent; sub- to flooding.	Slopes of 0 to 2 percent.	Subject to flooding; seasonal high water table; medium compressibility.	Severe: subject to flooding.

TABLE 8.—*Interpretations*

Soil series and map symbols	Suitability as source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes, levees, and pond embankments
Weikert: WcG	Poor: bedrock at depth of 8 to 20 inches; high in channery material.	Very poor: bedrock at depth of 8 to 20 inches.	Bedrock at depth of 8 to 20 inches; cuts and fills needed.	Bedrock at depth of 8 to 20 inches
Weinbach: WeA	Good: seasonal high water table.	Subsoil and substratum poor: fair stability and compaction; medium to high compressibility; fair shear strength; low shrink-swell potential; subject to frost heave; seasonal high water table.	Somewhat poorly drained; subject to frost heave; seasonal high water table.	Subsoil and substratum: fair stability and compaction; slow permeability when compacted; medium to high compressibility; good to poor resistance to piping; low shrink-swell potential; fair shear strength.
Wheeling: WhB2, WhC2, WlA, WlB2, WlC2, WlD2.	Good	Subsoil and substratum fair: fair to good stability and compaction; medium compressibility; fair shear strength; low shrink-swell potential; subject to frost heave.	Cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair to good stability and compaction; moderate permeability when compacted; medium compressibility; good to poor resistance to piping; low shrink-swell potential; fair shear strength.
Wilbur: Wm	Good: subject to flooding.	Subsoil and substratum fair: poor stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave and flooding.	Subject to flooding; subject to frost heave.	Subsoil and substratum: poor stability and compaction; mod erate permeability when compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.
Zanesville: ZaB2, ZaB3, ZaC2, ZaC3, ZaD2, ZaD3.	Good: limited thickness.	Subsoil and substratum poor: fair stability and compaction; medium to high compressibility; fair shear strength; low shrink-swell potential; subject to frost heave.	Cuts and fills needed; highly erodible when exposed in embankments; subject to frost heave.	Subsoil and substratum: fair stability and compaction; slow permeability when compacted; medium to high compressibility; good to poor resistance to piping; low shrink-swell potential; fair shear strength.
Zipp: Zp	Poor: clayey; seasonal high water table.	Subsoil and substratum poor: fair to poor stability and compaction; high compressibility; high shrink-swell potential; poor shear strength; seasonal high water table.	Very poorly drained; plastic material; seasonal high water table.	Subsoil and substratum: poor stability and compaction; slow permeability when compacted; high compressibility; good resistance to piping; high shrink-swell potential; poor shear strength.

of engineering properties —Continued

Soil features affecting—Continued					Soil limitations for septic tank filter fields
Pond reservoir areas	Agriculture drainage	Terrace and diversions	Grassed waterways	Foundations for low buildings	
Moderate permeability; bedrock at depth of 8 to 20 inches.	Moderate permeability; excessively drained.	Channery; bedrock at depth of 8 to 20 inches; slopes of 35 to 90 percent.	Channery; bedrock at depth of 8 to 20 inches; slopes of 35 to 90 percent.	Bedrock at depth of 8 to 20 inches; slopes of 35 to 90 percent.	Severe: bedrock at depth of 8 to 20 inches; slopes of 35 to 90 percent.
Seasonal high water table; slow to very slow seepage in subsoil and moderately slow in substratum.	Seasonal high water table; slowly permeable fragipan.	Slopes of 0 to 2 percent.	Slowly permeable fragipan at depth of 22 to 30 inches; slopes of 0 to 2 percent.	Somewhat poorly drained; slow permeability; fair shear strength; medium to high compressibility; seasonal high water table.	Severe: slow permeability.
Moderate permeability; moderate to rapid seepage.	Moderate permeability; well drained.	Slopes of 0 to 12 percent.	Slopes of 0 to 12 percent.	Fair shear strength; low shrink-swell potential; medium compressibility.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 18 percent.
Nearly level; moderate permeability; subject to flooding.	Subject to flooding.	Slopes of 0 to 2 percent; subject to flooding.	Slopes of 0 to 2 percent.	Subject to flooding; medium compressibility.	Severe: subject to flooding.
Moderate permeability in substratum.	Slow permeability; well drained to moderately well drained.	Slowly permeable fragipan at depth of 18 to 30 inches.	Slowly permeable fragipan at depth of 18 to 30 inches.	Fair shear strength; medium to high compressibility; low shrink-swell potential.	Severe: slow permeability.
Seasonal high water table; slow to very slow seepage.	Very slow permeability; seasonal high water table.	Slopes of 0 to 2 percent.	Slopes of 0 to 2 percent.	Poor shear strength; high shrink-swell potential; high compressibility; very poorly drained; very slow permeability; seasonal high water table.	Severe: very slow permeability; seasonal high water table.

The information does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists that is not known to all engineers. The Glossary defines many of these terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used by engineers for classifying are the Unified system and the system adopted by the American Association of State Highway Officials (AASHO).

In the Unified system (*10*), soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–CL.

The AASHO (*1*) is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 6; the estimated classification, without group index numbers, is given in table 7 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. *Sand*, *silt*, *clay* and some of the other terms used in the USDA textural classification are defined in the Glossary.

Engineering test data

Table 6 contains engineering test data for some of the major soil series in Clark and Floyd Counties. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction (or moisture-density) data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, density decreases in moisture content. The highest dry density obtained in the compactive test is termed maximum dry density. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semi-solid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state, and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Engineering properties of soils

Several estimated soil properties significant in engineering are given in table 7. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 7.

Depth to bedrock is the distance from the surface of the soil to the upper surface of the rock layer.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 7 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. Loam, for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, gravelly loamy sand. Sand, silt, clay, and some of the other terms used in USDA textural classification are defined in the Glossary.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 7 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil

at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Frost-heave potential was estimated for the soils as they occur in place. Frost heave is caused by ice lenses forming in the soil and the subsequent loss of strength as a result of excess moisture during periods of thawing. Soils that have a high percentage of silt and very fine sand are highly susceptible to frost heave.

Shrink-swell potential is the quality of the soil that determines its volume change in proportion to its moisture content. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Engineering interpretations of soils

The estimated interpretations in table 8 are based on the engineering properties of soils shown in table 7, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Clark and Floyd Counties. In table 8, ratings are used to summarize the limitation or suitability of the soils for all listed purposes other than for embankments, ponds and reservoirs, drainage of cropland and pasture, and terraces and diversions. For these particular uses, table 8 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, severe, and very severe. *Slight* means that the soil properties generally are favorable for the rated use or, in other words, that the limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that the soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation. *Very severe* means that there is one or more soil property so unfavorable for a particular use that overcoming the limitations is difficult and costly and commonly is not practical for the rated use.

Soil suitability is rated by the terms good, fair, and poor, which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material, as when used for preparing a seedbed; the natural fertility of the material, or the response of plants when fertilizer is applied; and the absence of substances toxic to plants. Texture of the soil material and the content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result in the area from which topsoil is taken.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

The entire soil profile is evaluated as to suitability for highway location. The ratings are for undisturbed soil without artificial drainage. Soil features considered are those that affect overall performance of the soil.

Dikes, levees, and embankments require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactability. Presence of stones or organic material in a soil are among the factors that are unfavorable.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Agriculture drainage is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Features that affect the suitability of the soils for grassed waterways are those that affect the growth and maintenance of vegetation and layout and construction.

Suitability as foundations for low buildings is determined by features of the undisturbed soils that affect their suitability for foundations of buildings up to three stories high. It is the substratum of the soil that generally provides the base for foundations. This is the soil material evaluated.

Septic tank filter fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or bedrock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Formation, Morphology, and Classification of the Soils

This section has three parts. The first part discusses the five major factors of soil formation. The second part discusses soil-forming processes influential in the development of the soils in Clark and Floyd Counties. The third part deals with the classification of the soils.

Factors of Soil Formation

Soil is produced by the action of soil-forming processes on material deposited or accumulated through natural processes. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the processes of soil development have been active.

Climate and vegetation are active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can form and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil. The amount of time may be short or long, but some time is always required for soil horizons to form. Usually, a long time is required for the development of distinct horizons.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

Parent material influences the textural, chemical, and mineralogical properties of soils. Parent material in Clark and Floyd Counties is variable. It consists of glacial till and outwash of Illinoian age; lacustrine deposits, or lakebed material, of Illinoian and Wisconsin age; residuum from limestone, sandstone, and shale; alluvium; and loess (windblown silt).

The Illinoian glaciation covered a major part of the survey area. Before this glaciation the area was cut by streams, and the preglacial topography still determines the most important features of the landscape. Ice erosion has rounded the existing hills, deepened the valleys, and steepened the valley walls.

As the ice receded from the uplands, a mantle of mixed stones, sand, silt, and clay, known as glacial till, was deposited over the bedrock. The melting ice produced a large volume of water, which carried large amounts of sand and gravel. Sand and gravel were deposited in stratified layers called glacial outwash. Both the till and the outwash are called glacial drift.

The till on the ridges and slopes ranges from a few inches to 10 feet or more in depth. The till in the valleys is much deeper. In parts of the area where glacial ice carried debris only short distances, the mantle of till is thin and came mostly from underlying rock. The deeper areas of drift consist mainly of material that was carried southward by glacial ice for hundreds of miles. Cincinnati and Jennings soils are examples of soils that formed in glacial till.

When the ice receded, lakes were formed in many of the valleys that were blocked by glacial drift or rock divides. In these temporary glacial lakes, sand and silt were first deposited by fairly fast-moving water that came from the melting ice. As the ice receded and the water backed in slowly, only the finer material of clay and silt size was carried into these lakes to settle out.

Lacustrine soils near the mouth of Silver Creek and other streams in Floyd County formed in fine-textured, calcareous material deposited by drift of Wisconsin age. Some of this material was carried down the existing Ohio Valley by melt water, but other material was washed from nearby places in the area. Markland and Uniontown soils are examples of soils that formed in lacustrine material.

In unglaciated areas, predominantly in the western part of the survey area, the soils formed in material weathered from the underlying bedrock. The sedimentary rocks, or geologic formations, consist of alternate layers of limestone, sandstone, and shale, all of which range from a few feet to several hundred feet in thickness. These formations have a gentle, downward tilt toward the west. Thus, from the eastern part of the area to the western part, different ages and formations of rock are exposed.

In the extreme eastern part of Clark County, limestone of the very old Ordovician period is exposed. Fairmount soils formed in material weathered from this kind of limestone. West of this, limestone of Silurian age is exposed. West of the Silurian limestone and throughout the central part of Clark County, black shale (fig. 11) and limestone of Devonian age are exposed. Trappist and Colyer soils are examples of soils that formed in material weathered from black shale.

In the western part of Clark County and in most of Floyd County, rock formations of the Lower Mississippian period are exposed. These rock formations consist of gray-green shale, commonly called soapstone, at low elevations. Rarden and Rockcastle soils are examples of soils formed in material weathered from gray-green shale. West of this and at higher elevations, interbedded brown sandstone, siltstone, and shale are exposed. Weikert and Berks soils are examples of soils that formed in these materials.

In the extreme western part of the area and at the highest elevations, limestone of the Lower Mississippian period is exposed. Crider, Hagerstown, and Corydon soils are examples of soils that formed over limestone of Silurian, Devonian, and Mississippian age.

Sediments deposited by water are the parent materials of soils on bottom lands and on terraces along the many drainageways that dissect the area. Haymond soils on bottom lands and Bartle soils on terraces are examples of soils that formed in this material. In the Ohio Valley, soils of considerable extent formed in old alluvium that washed from a wide variety of soils and rocks in the upper Ohio River basin, which includes parts of nine states. Wheeling and Weinbach soils are examples of soils that formed in this material.

A thin mantle of loess has been deposited over most of the area, and consequently, the upper part of most of the soils formed in silty parent material. The point of contact between the loess and the underlying residuum generally is distinct and easily distinguished in road cuts and other places where soil profiles are exposed. Grayford and Zanesville soils are examples of soils that have a thin

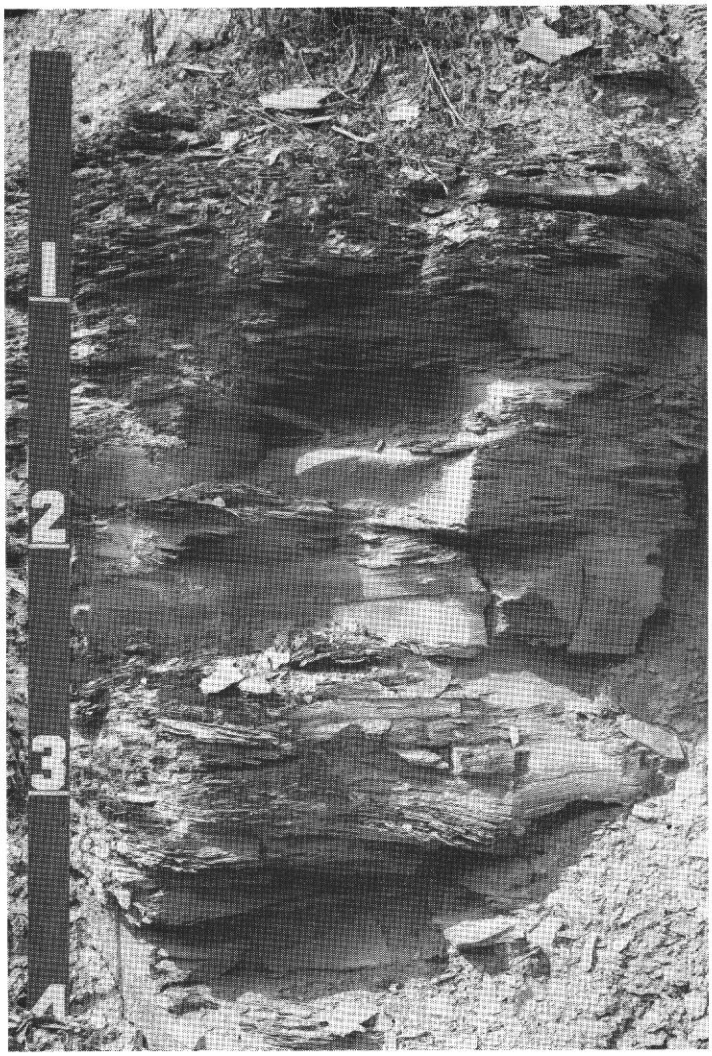

***Figure 11.*—A profile of partly weathered black shale bedrock. The shale is platy.**

mantle of loess over other materials. The loess mantle is thickest on upland soils near the Ohio River.

Climate

The climate of Clark and Floyd Counties is midcontinental in type and is characterized by wide variations in temperature. Average daily maximum temperatures reach 89°F. in July and average daily minimum temperatures drop to 22° in January.

Precipitation averages 42.6 inches annually. It is well distributed throughout the year, but is slightly greater in spring and early in summer than in fall and winter. The heavy rainfall has leached plant nutrients from the surface soil and kept free calcium carbonate from accumulating.

The climate is so uniform throughout the area that differences among the soils cannot be explained on the basis of differences in climate.

Climatic forces act upon rocks to form the parent materials from which soils form, but many of the more important soil characteristics would not develop except for the activity of living organisms. Without the changes brought about by the presence of plants and animals, the soils would consist merely of residual or transported materials derived from weathered rock, although some might have definite layers formed by additions of alluvial or colluvial materials by differential weathering or leaching.

Climate, acting alone on the parent material, would be largely destructive. It would cause the soluble materials to be washed out of the soils. When combined with the activities of plants and animals, however, the processes of climate become constructive. A reversible cycle is established between addition and depletion of plant nutrients. Plants draw nutrients from the lower part of the soil profile. When the plants die, the surface is renewed in varying degrees by the organic matter returned to the upper part of the soil. In Clark and Floyd Counties, the climate is such that leaching is greater than replacement. This is why most of the soils are strongly weathered, leached, acid, and of low fertility.

Plant and animal life

Before the settlement of the survey area, the native vegetation was most important in the complex of living organisms that affected soil development. Higher plants, micro-organisms, earthworms, and other forms of life that live on and in the soil contribute to its morphology. Bacteria and fungi are the micro-organisms that affect the soils. They cause raw plant waste to decompose into organic matter and to be incorporated into the soil. The higher plants return organic matter to the soil and bring moisture and plant nutrients from the lower part of the profile to the upper part.

The native vegetation of the area consists largely of hardwood trees. The most common species are tulip-poplar, oak, hickory, elm, maple, and ash. A comparatively small amount of organic matter derived from the forest became incorporated into the soils while they were forming. In upland forested areas that have never been cleared, thin layers of forest litter and leaf mold cover the soil. A small amount of organic matter derived from decayed leaves and twigs is mixed throughout the topmost 1 or 2 inches of the surface soil. In areas of Montgomery and Zipp soils, the native vegetation included swamp grasses and sedges, as well as water-tolerant trees. These soils were covered with water much of the year, and as the organic material fell it decayed slowly so that there was some accumulation.

The vegetation is fairly uniform throughout the area. Major differences in the soils, therefore, cannot be explained on the basis of differences in vegetation. Although some comparatively minor variations in the vegetation are associated with different soils, these variations are probably chiefly the result, and not the cause, of the differences among the soils.

Relief

The relief in Clark and Floyd Counties ranges from nearly level on bottom lands, terraces, and upland flats to extremely steep on breaks and hillsides. Much of the area has been highly dissected by weathering and stream cutting.

The variations in relief have affected drainage and the development of the soils in the area. The influence of relief upon soil formation is due to its controlling effect upon drainage, runoff, and other water effects, including normal and accelerated erosion. In Clark and Floyd Counties, differences in relief have radically affected moisture and air conditions within the soil. Soil profiles developed in the same parent materials in steep areas are not so strongly developed as those in level to sloping areas. This difference in soil development is due to (1) rapid normal erosion, (2) the reduced percolation of water through the soil, and (3) lack of sufficient water in the soil to support a vigorous growth of plants. The degree of profile development taking place within a given time or a given parent material and under the same type of vegetation depends largely on the amount of water passing through the soil.

In Clark and Floyd Counties, several different soils have developed from the same kind of parent material because of variation in relief. A good example of how relief has affected the soil profiles developed in the same parent material is the Cincinnati catena of soils formed in loess-capped glacial till. The level to nearly level Avonburg soils are somewhat poorly drained and are gray in the upper part of the subsoil.

The Rossmoyne soils formed on gently sloping topography, are moderately well drained, are pale brown in the upper part of the subsoil, and have some mottling. Cincinnati soils formed on sloping to strongly sloping topography, are well drained, and are strong brown in the upper part of the subsoil.

Time

Differences in length of time that soil-forming factors have been active account for most of the soil differences not attributed to the other factors of soil formation. The soils of Clark and Floyd Counties range from very old to very young. In general, the older soils have a greater degree of horizon differentiation than the younger soils.

Most soils that formed on the smoother parts of the uplands and on older stream terraces have a well-defined soil profile. These soils are old or mature. They formed in materials that are less resistant to weathering or that have been in place long enough for distinct horizons to have developed.

The soil materials on first bottoms and in local alluvial and colluvial soils are immature because the parent materials are young and new materials are deposited periodically. Soils on steep slopes are also likely to be immature because geological erosion removes the soil material nearly as fast as it accumulates. Runoff is more rapid, and less water percolates down through the soil. Some kinds of parent rock are so resistant to weathering that soil development is very slow, even though other conditions are favorable. A mature soil is one that has well-developed A and B horizons that were produced by the natural processes of soil formation. An immature soil has little or no horizon differentiation.

In Clark and Floyd Counties, the oldest soils formed in residuum weathered from sandstone, shale, siltstone, and limestone. The soils derived from lacustrine materials (Markland, Uniontown, Henshaw, Zipp, and Montgomery) developed in deposits of the Wisconsin age drift deposited 20,000 to 30,000 years ago. These lacustrine soils are along the valleys of streams and at the junction of the streams with the Ohio River. These soils are not so thoroughly nor so deeply leached as the soils formed in residual material.

The young soils are the shallow residual soils, such as the Corydon and Weikert soils, that are for the most part on steep slopes where natural erosion is nearly as rapid as soil formation. There are also young soils, such as the Haymond and Huntington soils, on bottom lands where new materials are deposited periodically.

Morphology

Several processes were involved in the formation of horizons in the soils of this area. These processes are (1) the accumulation of organic matter; (2) the solution, transfer, and reprecipitation of calcium carbonates and bases; (3) the liberation, reduction, and transfer of iron; and (4) the formation and translocation of silicate clay minerals. In most soils more than one of these processes have been active in the development of horizons.

The accumulation of organic matter in the upper part of the profile has been important in the formation of an A1 horizon. In general, the soils that have the most organic matter have the thickest or darkest surface horizons and have produced the most grass in the natural environment.

Carbonates and bases have been leached from the upper horizons of nearly all the soils of the area. This leaching has contributed to the development of horizons. Soil scientists generally agree that the removal of carbonates from the upper horizons of a soil generally precedes the translocation of silicate clay minerals.

The clay accumulates in pores and forms films on the surfaces along which water moves. In the soils of this area, leaching of bases and the translocation of silicate clays are among the more important processes in horizon differentiation. The Zanesville soils are examples of soils that have translocated silicate clays accumulated in the B2t horizon in the form of clay films.

The reduction and transfer of iron, a process called gleying, is evident in the poorly drained Clermont soils. The gray color in the subsoil indicates the reduction and loss of iron. Some horizons have mottles, which indicates segregation of iron.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationships to one another and to the whole environment, and to develop principles that help us in understanding their behavior and their response to manipulation.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

TABLE 9.—*Classification of soil series*

Series	Family [1]	Subgroup	Order
Avonburg	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Bartle	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Bedford	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Ultisols.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Bonnie	Fine-silty, mixed, acid, mesic	Fluventic Haplaquepts	Inceptisols.
Cincinnati	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Clermont	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols.
Colyer	Clayey-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Corydon	Clayey, mixed, mesic	Lithic Argiudolls	Mollisols.
Crider [2]	Fine-silty, mixed, mesic	Ultic Paleudalfs	Alfisols.
Fairmount	Clayey, mixed, mesic, shallow	Typic Hapludolls	Mollisols.
Gilpin	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Grayford	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Hagerstown [3]	Fine, mixed, mesic	Typic Paleudalfs	Alfisols.
Haymond	Coarse-silty, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Henshaw	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Hickory	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Hosmer	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Huntington	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols.
Jennings	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols.
Jennings, heavy subsoil variant.	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols.
Johnsburg	Fine-silty, mixed, mesic	Aquic Fragiudults	Ultisols.
Lindside	Fine-silty, mixed, mesic	Aquic Fluventic Eutrochrepts	Inceptisols.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Montgomery	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Newark	Fine-silty, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts	Inceptisols.
Pekin	Fine-silty, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Pope	Coarse-loamy, mixed, mesic	Fluventic Dystrochrepts	Inceptisols.
Rarden	Clayey, mixed, mesic	Aquic Hapludults	Ultisols.
Rockcastle	Fine, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Rossmoyne	Fine-silty, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Trappist	Clayey, mixed, mesic	Typic Hapludults	Ultisols.
Uniontown	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Wakeland	Coarse-silty, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts	Inceptisols.
Weikert	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Weinbach	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Wheeling	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Wilbur	Coarse-silty, mixed, mesic	Aquic Fluventic Eutrochrepts	Inceptisols.
Zanesville	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols.
Zipp	Fine, mixed, nonacid, mesic	Typic Haplaquepts	Inceptisols.

[1] The placement of some soil series in the current system, particularly the placement in the families, may change as more precise information becomes available. The classification used here was established in 1968.

[2] Soils named for the Crider series in this survey area are Typic Hapludalfs. They are outside the defined range for the Crider series in that they have a higher base status and are shallower to bedrock.

[3] Soils named for the Hagerstown series in the survey area are Typic Hapludalfs. They are outside the defined range for the Hagerstown series in that bedrock is at a depth of 40 to 60 inches.

The current system of classification was adopted for general use by the National Cooperative Soil Survey in 1965 (*9*). This system is under continual study. Therefore, readers interested in development of the current system should search the latest literature available (*4*).

The classification has six categories. Beginning with the most inclusive, the categories are the order, suborder, great group, subgroup, family, and series. Table 9 shows the classification of each of the soil series of the survey area by higher categories. Following are brief descriptions of each of the six categories in the system.

Orders.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions to this are the Entisols and Histosols, which occur in many climates. Each order is named with a word of three or four syllables ending in *sol* (Ult-i-*sol*).

Table 9 shows the four soil orders represented in the area: Inceptisols, Mollisols, Alfisols, and Ultisols.

Inceptisols are generally on young land surfaces. Their name is derived from the Latin *inceptum* for beginning. In Clark and Floyd Counties this order includes most, but not all, of the soils formerly called Alluvial soils.

Mollisols normally formed under grassy vegetation. They have thick, dark-colored surface layers called mollic epipedons. Their name is derived from the Latin *mollis* for soft. In Clark and Floyd Counties this order includes soils that were formerly called Alluvial soils, Rendzinas, Gray-Brown Podzolic soils, and Humic Gley soils.

Alfisols are soils that have a clay-enriched B horizon that is high in base saturation. In Clark and Floyd Counties this order includes soils formerly called Gray-Brown Podzolic soils, Red-Yellow Podzolic soils, and Planosols.

Ultisols are soils that have a clay-enriched B horizon that is low in base saturation. In Clark and Floyd Coun-

ties this order includes soils formerly called Red-Yellow Podzolic soils and Planosols.

Suborders.—Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to differentiate the suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is Udult (Ud, meaning humid, and ult, from Ultisol).

Great groups.—The suborders are divided into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used are those in which clay, iron, or humus have accumulated or those that have a fragipan that interferes with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, and major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium). The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Fragiudult (Fragi, meaning fragipan, ud for humid, and ult, from Ultisol).

Subgroups.—Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and others called intergrades that have properties of another group, suborder, or order. Subgroups may also be established in those instances where soil properties intergrade outside the range of a great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Fragiudult.

Families.—Families are established within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for characteristics, such as texture and mineralogy, that are used as family differentiate. An example is the fine-silty, mixed, mesic family of Typic Fragiudults.

Series.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile. They are given the name of a geographic location near the place where that series was first observed and mapped. An example is the Bedford series.

General Nature of the Area

This section discusses the history, farming and natural resources, and climate of Clark and Floyd Counties. It also discusses drainage, physiography, and relief and gives other information about the survey area.

History

The area that is now Clark and Floyd Counties was once occupied by prehistoric people. Artifacts taken from the Falls area near Clarksville indicate that early Indian cultures thrived in this area about 4,000 years ago. Archaeologists and amateur collectors of artifacts of these early cultures long have considered this area a prime hunting ground. In 1778 General George Rogers Clark arrived at the Falls on the Ohio River. He crossed into Indiana later that year and launched his conquest of the vast Northwest. Clark returned to the area in 1784 and founded Clarksville, the first American settlement in the new territory. The county was organized in 1801. The first county seat was at Springville, a once-thriving trading center near the present site of Charlestown. Jeffersonville became the county seat in 1802, Charlestown in 1810, and Jeffersonville again in 1873.

Floyd County was organized in 1819. At that time, New Albany became the county seat and the first incorporated town. It has remained the county seat until the present. Greenville became a town in 1816, Georgetown in 1833, Galena in 1837, and Floyds Knobs in 1840.

Farming and Natural Resources

According to the Census of Agriculture, in the 14-year period from 1950 to 1964 the population in the area has increased from 92,285 to 119,447. This increase in population is mainly due to the increase in industry that has taken place. In 1959, 221,341 acres were in farms, compared to 159,675 acres in 1964.

Between 1959 and 1964 the number of farms decreased from 2,262 to 1,807, a decrease of 455 farms in 5 years. The average size of farms increased from 91.6 acres in 1959 to 101.0 acres in 1964.

Full owners of farms have decreased in number from 1,787 in 1959 to 1,366 in 1964. The number of part-owners decreased from 336 in 1959 to 314 in 1964. Tenancy dropped from 135 to 119 in this period, and the number of managers reported increased from 4 to 8.

Farming in the area is based mainly on grain farming and the raising of livestock, chiefly hogs and cattle. The northeastern part of Clark County is suited to grain-hog farming. The soils in the other parts of the area are suited to general farming.

Corn and soybeans are the main crops grown in the county. Wheat is next in importance. Some farmers derive much of their income from small acreages of tobacco (fig. 12). Meadow crops provide pasture for livestock. Most pastures consist of a mixture of Ladino clover, red clover, and grass. In recent years fescue pastures have been highly successful.

Vegetable crops are grown commercially in numerous small areas. These crops include cucumbers, sweet corn, strawberries, cantaloups and muskmelons, tomatoes, and snap beans. They are grown mostly on gently sloping and sloping ridgetops in the "Knobs" area in association 3, shown on the general soil map. Here the frost-free period is slightly longer than in other parts of the area. The use of ponds for irrigation is increasing. Some of these vegetables are sold locally, but most of them are sold through outlets in Louisville, Kentucky.

Figure 12.—**Burley tobacco and corn on Avonburg silt loam, 0 to 2 percent slopes.**

Climate [3]

Clark and Floyd Counties have an invigorating climate with four well-defined seasons of the year because of its location in the middle latitudes and in the interior of a continent away from the moderating effect of oceans. Air of both tropical and polar origin plies the area and brings frequent changes in temperature and humidity, and well-distributed rainfall. Low-pressure centers from the west cross the plains and move up the Ohio River Valley and the St. Lawrence River Valley to the Atlantic. Most rainfall comes from these storms. Afternoon thunderstorms are the primary source of rainfall in summer; they average about 49 a year. About one thunderstorm a year occurs during the winter months. Severe storms are rare, but eight tornades were reported in Clark County and three in Floyd County in the 50-year period from 1916 to 1966.

Temperature in July, the warmest month of the year, reaches 90° F. or higher on an average of 16 days a year. The winter season averages 4 days with temperatures below zero. January is usually the coldest month of the year.

[3] By LAWRENCE A. SCHAAL, climatologist for Indiana, National Weather Service, U.S. Department of Commerce.

Precipitation is usually greatest late in spring and early in summer. The winter months average about 3.5 inches and the spring months about 4 inches. April, May, and June each average 7 days when there is 0.10 inch or more of rain. The number of days drops to 5 late in summer and in winter. Droughts are infrequent and affect farming only occasionally.

Heavy rainfall of 2.0 inches in 1 hour occurs about once in 25 years, and about once in 10 years, rainfall amounts to 1.8 inches in 1 hour. In a 6-hour period, a rainfall of 3.1 inches occurs about once in 25 years, and a rainfall of 2.7 inches, once in a 10-year period.

Snowfall has occurred as early as October and as late as May. The greatest accumulations of snow usually come in December or January. The heaviest snowfalls recorded for any one day during the past 35 years were 9 inches on November 28, 1958, and 9 inches on March 3, 1960. The greatest monthly total, 17.0 inches, also fell in March of 1960. The average yearly snowfall is 12.1 inches. Many severe cold periods are preceded by snowfall, which protects over-wintering crops from extreme temperatures.

Relative humidity varies on an average summer day from the 40's during a typical summer afternoon to 90° or higher just before dawn. Relative humidity rises and falls much as temperature does during a 24-hour period, but the highest relative humidity usually occurs with

a minimum temperature, and the lowest with the maximum temperature. In winter the most probable range of relative humidity is from 60 to 90 percent. Southerly winds bring higher humidity than northerly winds.

Prevailing winds are from the south except late in winter when they are from the northeast and in September and October when they are from the southeast. At a height of 20 feet above the ground the average wind velocity is 10 miles per hour in spring and near 6 miles per hour late in summer.

The best weather for outdoor activities is in fall, when temperatures are usually in the comfortable range, showers are least frequent, and the percentage of sunshine compared to the maximum possible averages about 70 percent.

Data on temperature and precipitation are given in table 10. The probabilities of the last freezing temperatures in spring and the first in fall are given in table 11.

Water Supply

The sources of water vary widely throughout the area. Most towns get their water either directly from the Ohio River or from deep wells. Deep wells in the gravelly outwash areas along the Ohio River furnish an abundant supply of water for several towns.

In many places in the area not enough water can be obtained from dug wells, drilled wells, or springs to supply all the needs for domestic and farm use. The flow of water from springs is not sufficient, and the water in

TABLE 10.—*Temperature and precipitation at Henryville, Clark County, Ind.*

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average monthly maximum	Average monthly minimum	Average total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
	°F.	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	41	22	63	−3	4. 1	1. 3	7. 5	3	3
February	45	24	66	1	3. 7	. 9	7. 0	2	3
March	55	31	76	13	4. 4	1. 8	8. 5	1	2
April	67	40	85	22	3. 8	1. 4	6. 4	0	0
May	77	50	90	33	4. 0	1. 3	6. 8	0	0
June	86	59	96	44	4. 5	1. 0	8. 2	0	0
July	89	63	99	50	3. 6	1. 7	6. 1	0	0
August	89	62	99	47	3. 1	. 9	5. 3	0	0
September	82	53	95	35	2. 8	. 8	4. 9	0	0
October	72	42	87	24	2. 5	. 5	4. 9	0	0
November	55	31	76	12	3. 2	1. 3	6. 3	[1]	3
December	44	23	63	2	2. 9	1. 1	5. 1	2	3
Year	67	42	[2] 101	[3] −9	42. 6	31. 8	50. 5	8	3

[1] Less than half a day.
[2] Average annual maximum.
[3] Average annual minimum.

TABLE 11.—*Probabilities of last freezing temperatures in spring and first in fall at Henryville, Clark County, Ind.*

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 25	April 10	April 18	May 1	May 16
2 years in 10 later than	March 20	April 4	April 13	April 27	May 11
5 years in 10 later than	March 8	March 23	April 2	April 19	May 2
Fall:					
1 year in 10 earlier than	November	October 27	October 20	October 5	September 22
2 years in 10 earlier than	November 10	November 1	October 24	October 10	September 26
5 years in 10 earlier than	November 26	November 13	November 1	October 20	October 6

many drilled wells is mineral water too salty for drinking. Cisterns have been dug in some places, but these fail when rainfall is low and other sources are needed.

Most of the water supply is stored in reservoirs, lakes, and ponds (fig. 13). In many places the terrain provides sites suitable for ponds and lakes. In many parts of the area water for farm use is also supplied by rural water lines that run from the Ohio River.

Oportunities exist through the Watershed Program of building multi-purpose structures. These will provide a source of water for industrial and recreational use, as well as flood protection.

Drainage, Physiography, and Relief

The Ohio River and its many tributaries drain all of the survey area. The river forms the southern boundary of both counties.

Silver Creek, the largest tributary, drains the central part of Clark County and the eastern part of Floyd County. Fourteenmile Creek drains the eastern part of Clark County, and Muddy Fork Creek drains the western part. Indian Creek drains the western part of Floyd County.

The Ohio River is bordered by broad bottom lands and terraces that are subject to occasional flooding. The towns of Jeffersonville, Clarksville, and New Albany are protected by levees from severe flooding.

Silver Creek and Muddy Fork Creek are bordered by valleys that range from half a mile to a few rods in width. They are mostly surrounded by gently sloping and nearly level terraces. These bottom-land areas are well drained to somewhat poorly drained or poorly drained, and they are frequently flooded. Fourteenmile Creek is bordered by narrow, well-drained bottom-land areas and extremely steep limestone bluffs. Indian Creek is bordered by valleys that range mostly from one-fourth mile to a few rods in width. These bottom-land areas are well drained and moderately well drained and are frequently flooded.

Other small streams in the area are tributaries of these creeks. These small streams are bordered by narrow bottom lands surrounded by short slopes that are sloping to extremely steep.

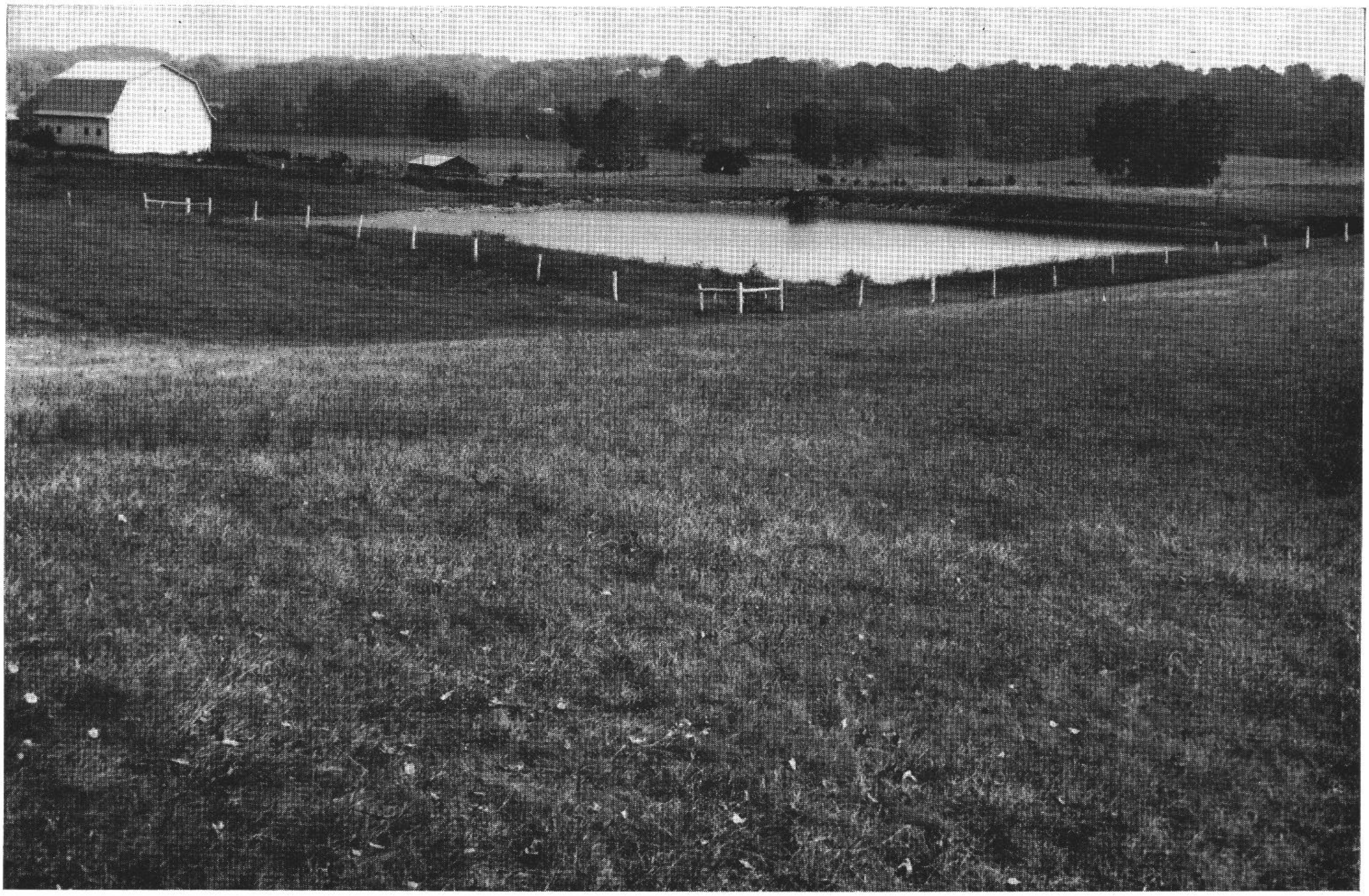

Figure 13.—**Farm pond on Cincinnati silt loam, 6 to 12 percent slopes, eroded.**

Industries, Transportation, and Markets

In addition to farming, there are many industries in the area. There are two chemical industries, one in Charlestown and the other in Clarksville. Clarksville also has a veneer mill. There are two factories in Jeffersonville. One manufactures boats and barges, and the other manufactures soaps, detergents, and toilet articles. Near Sellersburg is a manufacturer of cement, one of fireplace fixtures, and a stone company. New Albany has a manufacturer of prefab homes and a bakery. There are several cabinet and clothing manufacturers in the area. Several railroads serve the area. The Baltimore and Ohio and the Penn Central Railroads pass through Clark County in a north-south direction. The Monon Railroad passes through the western part of Clark County and the eastern part of Floyd County. The Southern Railroad passes through the center of Floyd County in an east-west direction.

Several State and Federal highways pass through the area. In Clark County, Interstate 65 and U.S. Highway No. 31 cross the county in a north-south direction. State Routes 3 and 62 cross the county in a north-south direction, and State Routes 60 and 160 cross the western part of Clark County in an east-west direction. In Floyd County, Interstate 64, U.S. Highway No. 150, and U.S. Highway No. 460 cross the county in an east-west direction.

Six bridges span the Ohio River to Louisville, Kentucky. Two of these are railroad bridges leading from Jeffersonville to Louisville. Another is a railroad and toll bridge from New Albany to Louisville. One bridge leading from Jeffersonville to Louisville carries traffic from U.S. Highway No. 31 and U.S. Highway No. 460. Another bridge from Jeffersonville to Louisville carries traffic from Interstate 65. In addition, a bridge from New Albany to Louisville carries traffic from Interstate 64.

Bus service is available in most of the larger towns. There is a small airport for noncommercial planes north of Clarksville. Three bargelines that run on the Ohio River also serve the area.

Markets for livestock, tobacco, and other farm products are available in Louisville, Kentucky. There is also a tobacco market at Madison, Indiana.

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Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course, and, thus, to protect areas downslope from the effects of such runoff.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, that is commonly the result of artificial

drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, generally in the lower horizons, as a result of waterlogging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Green manure (Agronomy). A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R Layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water table or elevation of the land.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Loess. Fine-grained material, dominantly of silt-size particles, that has been deposited by wind.

Mineral soil. Soil composed mainly of inorganic (mineral) material and low in content of organic matter. Its bulk density is greater than that of the organic soil.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Plow layer. The soil ordinarily moved in tillage; equivalent to surface soil.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkine	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Second bottom. The first terrace above the normal flood plains of a stream.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prism with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

For a full description of a mapping unit, read both the description of the mapping unit and the soil series t[illegible]e mapping unit belongs. In referring to a capability unit or woodland suitability group, read the introduction to the section it is in for general information about its management. For information on wildlife, refer t[illegible]ion beginning on page 58. Other information is given in tables as follows:

Acreage and extent, table 1, page 6.
Predicted yields, table 2, page 52.
Limitations for recreational uses, table 5, page 65.

Engineering uses of the soils, tables 6, 7, and 8, pages 70 through 87.

Map symbol	Mapping unit	Page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
AvA	Avonburg silt loam, 0 to 2 percent slopes	8	IIw-3	47	5	55
AvB	Avonburg silt loam, 2 to 4 percent slopes	8	IIw-3	47	5	55
Ba	Bartle silt loam	9	IIw-3	47	5	55
BdA	Bedford silt loam, 0 to 2 percent slopes	10	IIw-5	47	9	56
BdB	Bedford silt loam, 2 to 6 percent slopes	10	IIe-7	46	9	56
BeF	Berks channery silt loam, 18 to 35 percent slopes	10	VIIe-2	50	12	57
Bo	Bonnie silt loam	11	IIIw-10	48	11	56
CcB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded	12	IIe-7	46	9	56
CcC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	12	IIIe-7	48	9	56
CcC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	12	IVe-7	49	9	56
CcD2	Cincinnati silt loam, 12 to 18 percent slopes, eroded	12	IVe-7	49	9	56
CcD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	12	VIe-1	49	9	56
Ce	Clermont silt loam	13	IIIw-12	49	11	56
ChF	Colyer shaly silt loam, 18 to 35 percent slopes	14	VIIe-2	50	22	58
CoE	Corydon stony silt loam, 12 to 25 percent slopes	15	VIe-2	50	7	56
CoG	Corydon stony silt loam, 25 to 70 percent slopes	15	VIIe-1	50	7	56
CrA	Crider silt loam, 0 to 2 percent slopes	15	I-1	46	1	55
CrB2	Crider silt loam, 2 to 6 percent slopes, eroded	15	IIe-3	46	1	55
CrB3	Crider silt loam, 2 to 6 percent slopes, severely eroded	16	IIIe-3	48	1	55
CrC2	Crider silt loam, 6 to 12 percent slopes, eroded	16	IIIe-3	48	1	55
CrC3	Crider silt loam, 6 to 12 percent slopes, severely eroded	16	IVe-3	49	1	55
CrD2	Crider silt loam, 12 to 18 percent slopes, eroded	16	IVe-3	49	1	55
CrD3	Crider silt loam, 12 to 18 percent slopes, severely eroded	17	VIe-1	49	1	55
FaE	Fairmount silty clay loam, 12 to 25 percent slopes	17	VIIe-2	50	7	56
FcG	Fairmount stony silty clay loam, 25 to 70 percent slopes	17	VIIe-2	50	7	56
GlC2	Gilpin silt loam, 6 to 12 percent slopes, eroded	18	IVe-8	49	10	56
GlC3	Gilpin silt loam, 6 to 12 percent slopes, severely eroded	18	VIe-1	49	10	56
GlD2	Gilpin silt loam, 12 to 18 percent slopes, eroded	18	VIe-1	49	10	56
GlD3	Gilpin silt loam, 12 to 18 percent slopes, severely eroded	18	VIIe-1	50	10	56
GlE2	Gilpin silt loam, 18 to 25 percent slopes, eroded	19	VIe-1	49	10	56
GrA	Grayford silt loam, 0 to 2 percent slopes	19	I-1	46	1	55
GrB2	Grayford silt loam, 2 to 6 percent slopes, eroded	19	IIe-3	46	1	55
GrC2	Grayford silt loam, 6 to 12 percent slopes, eroded	20	IIIe-3	48	1	55
GrC3	Grayford silt loam, 6 to 12 percent slopes, severely eroded	20	IVe-3	49	1	55
GrD2	Grayford silt loam, 12 to 18 percent slopes, eroded	20	IVe-3	49	1	55
GrD3	Grayford silt loam, 12 to 18 percent slopes, severely eroded	21	VIe-1	49	1	55
GrE2	Grayford silt loam, 18 to 25 percent slopes, eroded	21	VIe-1	49	6	56
Gu	Gullied land	21	VIIe-1	50	14	57
HaC2	Hagerstown silt loam, 6 to 12 percent slopes, eroded	22	IIIe-3	48	1	55
HaD2	Hagerstown silt loam, 12 to 18 percent slopes, eroded	22	IVe-3	49	1	55
HaE2	Hagerstown silt loam, 18 to 25 percent slopes, eroded	22	VIe-1	49	6	56
HcC3	Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	22	IVe-3	49	1	55
HcD3	Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded	22	VIe-1	49	1	55
HcE3	Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded	22	VIe-1	49	6	56
Hd	Haymond silt loam	23	I-2	46	8	56
HeA	Henshaw silt loam, 0 to 2 percent slopes	24	IIw-2	47	5	55
HkE2	Hickory silt loam, 18 to 25 percent slopes, eroded	25	VIe-1	49	2	55
HoA	Hosmer silt loam, 0 to 2 percent slopes	25	IIw-5	47	9	56
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded	26	IIe-7	46	9	56
HoC2	Hosmer silt loam, 6 to 12 percent slopes, eroded	26	IIIe-7	48	9	56
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded	26	IVe-7	49	9	56
HoD2	Hosmer silt loam, 12 to 18 percent slopes, eroded	26	IVe-7	49	9	56
Hu	Huntington silt loam	26	I-2	46	8	56
JeA	Jennings silt loam, 0 to 2 percent slopes	27	IIw-5	47	9	56
JeB2	Jennings silt loam, 2 to 6 percent slopes, eroded	27	IIe-7	46	9	56
JhB2	Jennings silt loam, heavy subsoil variant, 2 to 6 percent slopes, eroded	28	IIe-7	46	9	56
JhC2	Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, eroded	28	IIIe-7	48	9	56
JhC3	Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, severely eroded	28	IVe-7	49	9	56
JhD2	Jennings silt loam, heavy subsoil variant, 12 to 18 percent slopes, eroded	28	IVe-7	49	9	56
JoA	Johnsburg silt loam, 0 to 2 percent slopes	29	IIIw-3	48	5	55
Ln	Lindside silt loam	30	I-2	46	8	56
MaC2	Markland silt loam, 6 to 12 percent slopes, eroded	30	IVe-11	49	18	58
MaD2	Markland silt loam, 12 to 18 percent slopes, eroded	30	VIe-1	49	18	58
MaE2	Markland silt loam, 18 to 25 percent slopes, eroded	31	VIIe-1	50	18	58
Mo	Montgomery silty clay	31	IIIw-2	48	11	56
Ne	Newark silt loam	32	IIw-7	47	13	57
PeB2	Pekin silt loam, 2 to 6 percent slopes, eroded	33	IIe-7	46	9	56
Ps	Pits	33	VIIe-3	51	16	58
Pt	Pope silt loam	33	IIs-1	47	8	56
RdC2	Rarden silt loam, 6 to 12 percent slopes, eroded	34	IVe-8	49	22	58
RdD2	Rarden silt loam, 12 to 18 percent slopes, eroded	34	VIe-1	49	22	58
ReC3	Rarden silty clay loam, 6 to 12 percent slopes, severely eroded	34	VIe-1	49	22	58
ReD3	Rarden silty clay loam, 12 to 18 percent slopes, severely eroded	34	VIIe-1	50	22	58
RkF	Rockcastle silt loam, 18 to 55 percent slopes	35	VIIe-2	50	22	58
RoA	Rossmoyne silt loam, 0 to 2 percent slopes	36	IIw-5	47	9	56
RoB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded	36	IIe-7	46	9	56
RoB3	Rossmoyne silt loam, 2 to 6 percent slopes, severely eroded	36	IIIe-7	48	9	56
TrC2	Trappist silt loam, 6 to 12 percent slopes, eroded	37	IVe-8	49	10	56
TrC3	Trappist silt loam, 6 to 12 percent slopes, severely eroded	37	VIe-1	49	10	56
TrD2	Trappist silt loam, 12 to 18 percent slopes, eroded	37	VIe-1	49	10	56
TrD3	Trappist silt loam, 12 to 18 percent slopes, severely eroded	38	VIIe-1	50	10	56
UnB2	Uniontown silt loam, 2 to 6 percent slopes, eroded	38	IIe-3	46	1	55
UnC2	Uniontown silt loam, 6 to 12 percent slopes, eroded	38	IIIe-3	48	1	55
Wa	Wakeland silt loam	39	IIw-7	47	13	57
WcG	Weikert channery silt loam, 35 to 90 percent slopes	40	VIIe-2	50	22	58
WeA	Weinbach silt loam, 0 to 2 percent slopes	41	IIw-3	47	5	55
WhB2	Wheeling fine sandy loam, 2 to 6 percent slopes, eroded	41	IIe-11	47	1	55
WhC2	Wheeling fine sandy loam, 6 to 12 percent slopes, eroded	41	IIIe-15	48	1	55
WlA	Wheeling silt loam, 0 to 2 percent slopes	41	I-1	46	1	55
WlB2	Wheeling silt loam, 2 to 6 percent slopes, eroded	42	IIe-3	46	1	55
WlC2	Wheeling silt loam, 6 to 12 percent slopes, eroded	42	IIIe-3	48	1	55
WlD2	Wheeling silt loam, 12 to 18 percent slopes, eroded	42	IVe-3	49	1	55
Wm	Wilbur silt loam	42	I-2	46	8	56
ZaB2	Zanesville silt loam, 2 to 6 percent slopes, eroded	43	IIe-7	46	9	56
ZaB3	Zanesville silt loam, 2 to 6 percent slopes, severely eroded	43	IIIe-7	48	9	56
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded	43	IIIe-7	48	9	56
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded	44	IVe-7	49	9	56
ZaD2	Zanesville silt loam, 12 to 18 percent slopes, eroded	44	VIe-1	49	9	56
ZaD3	Zanesville silt loam, 12 to 18 percent slopes, severely eroded	44	VIIe-1	50	9	56
Zp	Zipp silty clay	44	IIIw-2	48	11	56

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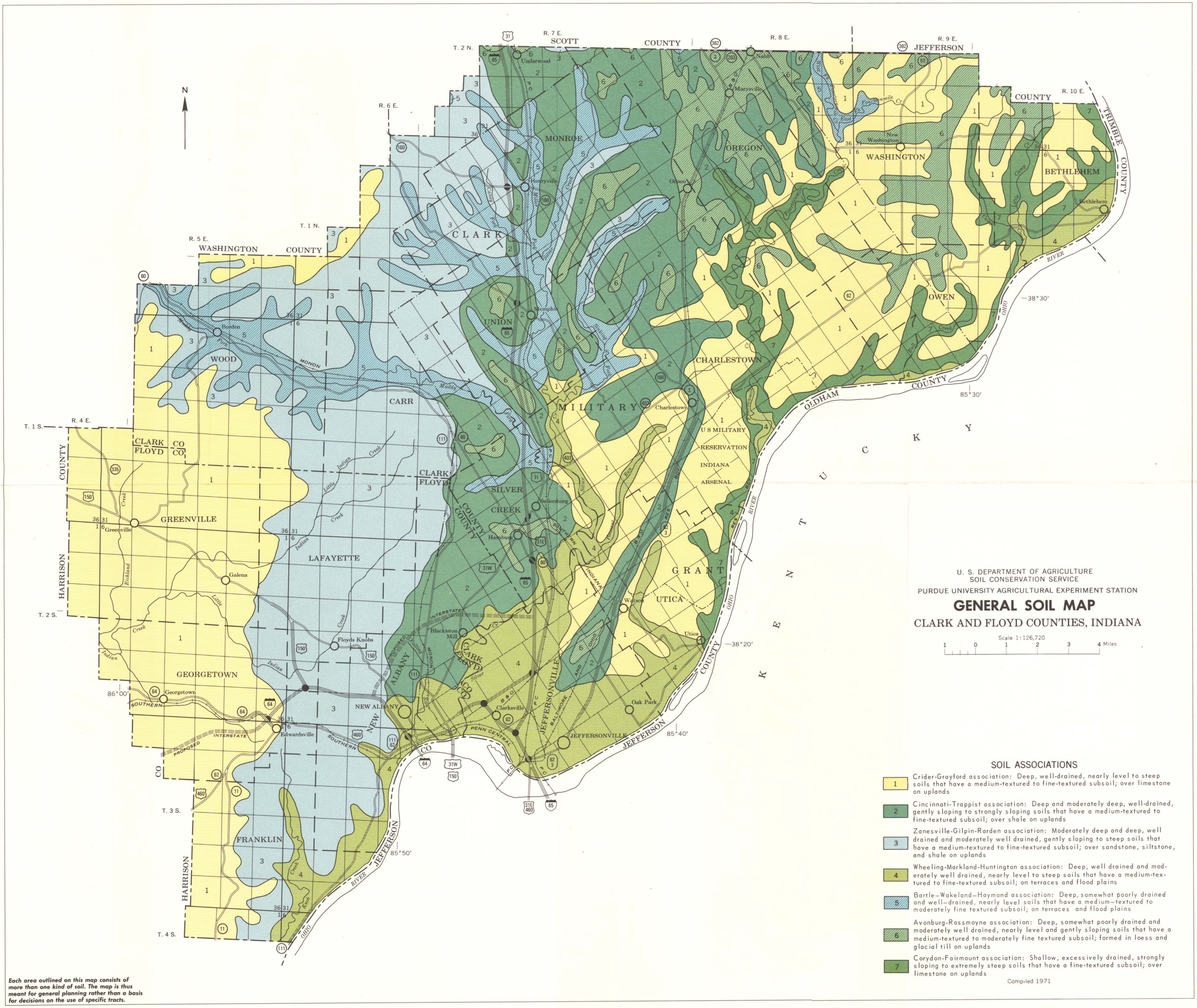


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

CLARK AND FLOYD COUNTIES, INDIANA

Scale 1:126,720

1 0 1 2 3 4 Miles

SOIL ASSOCIATIONS

1 Crider-Grayford association: Deep, well-drained, nearly level to steep soils that have a medium-textured to fine-textured subsoil; over limestone on uplands

2 Cincinnati-Trappist association: Deep and moderately deep, well-drained, gently sloping to strongly sloping soils that have a medium-textured to fine-textured subsoil; over shale on uplands

3 Zanesville-Gilpin-Rarden association: Moderately deep and deep, well drained and moderately well drained, gently sloping to steep soils that have a medium-textured to fine-textured subsoil; over sandstone, siltstone, and shale on uplands

4 Wheeling-Markland-Huntington association: Deep, well drained and moderately well drained, nearly level to steep soils that have a medium-textured to fine-textured subsoil; on terraces and flood plains

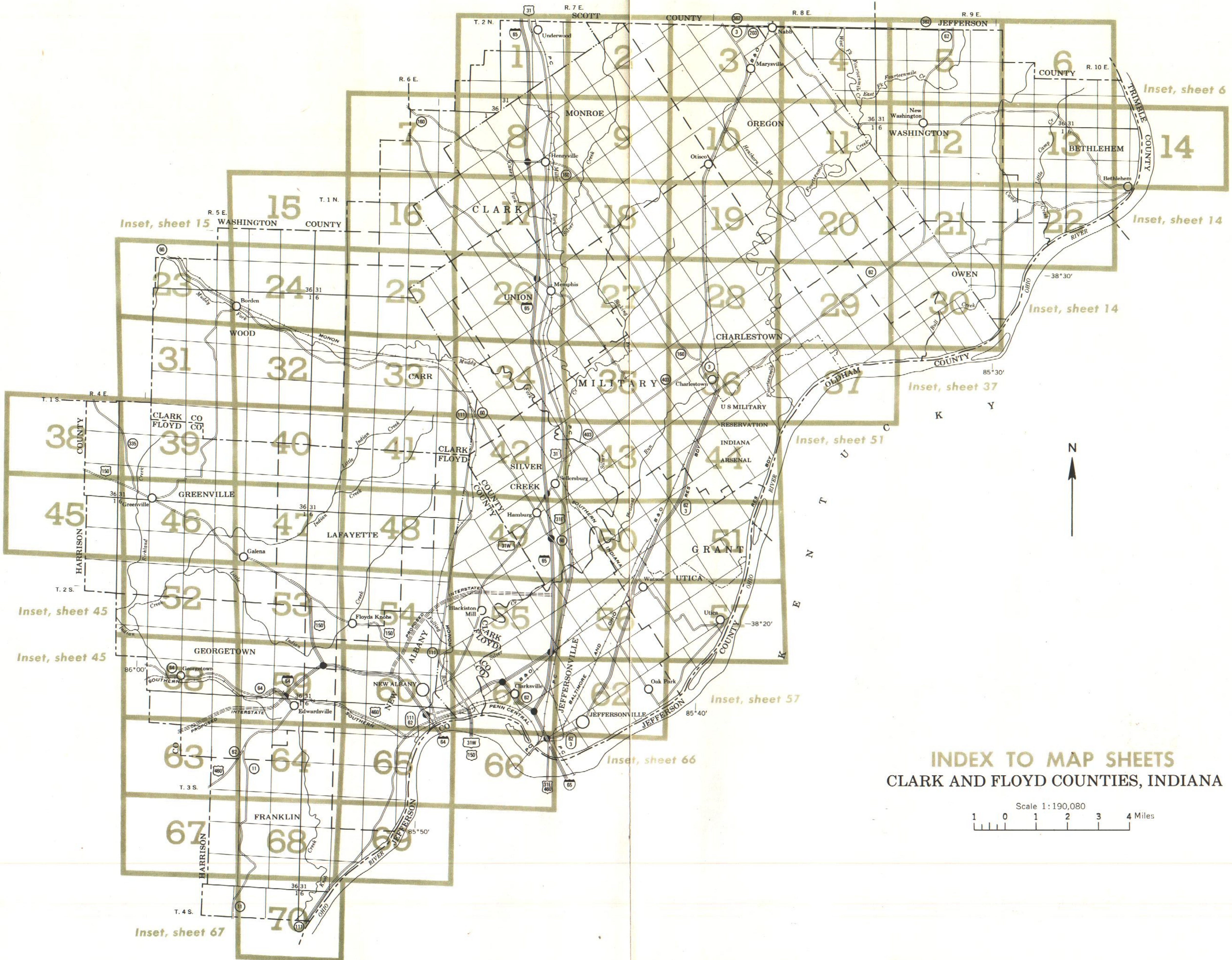
5 Bartle-Wakeland-Haymond association: Deep, somewhat poorly drained and well-drained, nearly level soils that have a medium-textured to moderately fine textured subsoil; on terraces and flood plains

6 Avonburg-Rossmoyne association: Deep, somewhat poorly drained and moderately well drained, nearly level and gently sloping soils that have a medium-textured to moderately fine textured subsoil; formed in loess and glacial till on uplands

7 Corydon-Fairmount association: Shallow, excessively drained, strongly sloping to extremely steep soils that have a fine-textured subsoil; over limestone on uplands

Compiled 1971

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

CLARK AND FLOYD COUNTIES, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles

SOIL LEGEND

The first capital letter is the initial one of the soil name. The second capital letter, A, B, C, D, E, F, or G, shows the slope. Symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. The number, 2 or 3, in the symbol indicates that the soil is eroded or severely eroded.

SYMBOL	NAME
AvA	Avonburg silt loam, 0 to 2 percent slopes
AvB	Avonburg silt loam, 2 to 4 percent slopes
Ba	Bartle silt loam
BdA	Bedford silt loam, 0 to 2 percent slopes
BdB	Bedford silt loam, 2 to 6 percent slopes
BeF	Berks channery silt loam, 18 to 35 percent slopes
Bo	Bonnie silt loam
CcB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded
CcC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded
CcC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded
CcD2	Cincinnati silt loam, 12 to 18 percent slopes, eroded
CcD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded
Ce	Clermont silt loam
ChF	Colyer shaly silt loam, 18 to 35 percent slopes
CoE	Corydon stony silt loam, 12 to 25 percent slopes
CoG	Corydon stony silt loam, 25 to 70 percent slopes
CrA	Crider silt loam, 0 to 2 percent slopes
CrB2	Crider silt loam, 2 to 6 percent slopes, eroded
CrB3	Crider silt loam, 2 to 6 percent slopes, severely eroded
CrC2	Crider silt loam, 6 to 12 percent slopes, eroded
CrC3	Crider silt loam, 6 to 12 percent slopes, severely eroded
CrD2	Crider silt loam, 12 to 18 percent slopes, eroded
CrD3	Crider silt loam, 12 to 18 percent slopes, severely eroded
FaE	Fairmount silty clay loam, 12 to 25 percent slopes
FcG	Fairmount stony silty clay loam, 25 to 70 percent slopes
GlC2	Gilpin silt loam, 6 to 12 percent slopes, eroded
GlC3	Gilpin silt loam, 6 to 12 percent slopes, severely eroded
GlD2	Gilpin silt loam, 12 to 18 percent slopes, eroded
GlD3	Gilpin silt loam, 12 to 18 percent slopes, severely eroded
GlE2	Gilpin silt loam, 18 to 25 percent slopes, eroded
GrA	Grayford silt loam, 0 to 2 percent slopes
GrB2	Grayford silt loam, 2 to 6 percent slopes, eroded
GrC2	Grayford silt loam, 6 to 12 percent slopes, eroded
GrC3	Grayford silt loam, 6 to 12 percent slopes, severely eroded
GrD2	Grayford silt loam, 12 to 18 percent slopes, eroded
GrD3	Grayford silt loam, 12 to 18 percent slopes, severely eroded
GrE2	Grayford silt loam, 18 to 25 percent slopes, eroded
Gu	Gullied land
HaC2	Hagerstown silt loam, 6 to 12 percent slopes, eroded
HaD2	Hagerstown silt loam, 12 to 18 percent slopes, eroded
HaE2	Hagerstown silt loam, 18 to 25 percent slopes, eroded
HcC3	Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded
HcD3	Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded
HcE3	Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded
Hd	Haymond silt loam
HeA	Henshaw silt loam, 0 to 2 percent slopes
HkE2	Hickory silt loam, 18 to 25 percent slopes, eroded
HoA	Hosmer silt loam, 0 to 2 percent slopes
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded
HoC2	Hosmer silt loam, 6 to 12 percent slopes, eroded
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded
HoD2	Hosmer silt loam, 12 to 18 percent slopes, eroded
Hu	Huntington silt loam
JeA	Jennings silt loam, 0 to 2 percent slopes
JeB2	Jennings silt loam, 2 to 6 percent slopes, eroded
JhB2	Jennings silt loam, heavy subsoil variant, 2 to 6 percent slopes, eroded
JhC2	Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, eroded
JhC3	Jennings silt loam, heavy subsoil variant, 6 to 12 percent slopes, severely eroded
JhD2	Jennings silt loam, heavy subsoil variant, 12 to 18 percent slopes, eroded
JoA	Johnsburg silt loam, 0 to 2 percent slopes
Ln	Lindside silt loam
MaC2	Markland silt loam, 6 to 12 percent slopes, eroded
MaD2	Markland silt loam, 12 to 18 percent slopes, eroded
MaE2	Markland silt loam, 18 to 25 percent slopes, eroded
Mo	Montgomery silty clay
Ne	Newark silt loam
PeB2	Pekin silt loam, 2 to 6 percent slopes, eroded
Ps	Pits
Pt	Pope silt loam
RdC2	Rarden silt loam, 6 to 12 percent slopes, eroded
RdD2	Rarden silt loam, 12 to 18 percent slopes, eroded
ReC3	Rarden silty clay loam, 6 to 12 percent slopes, severely eroded
ReD3	Rarden silty clay loam, 12 to 18 percent slopes, severely eroded
RkF	Rockcastle silt loam, 18 to 55 percent slopes
RoA	Rossmoyne silt loam, 0 to 2 percent slopes
RoB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded
RoB3	Rossmoyne silt loam, 2 to 6 percent slopes, severely eroded
TrC2	Trappist silt loam, 6 to 12 percent slopes, eroded
TrC3	Trappist silt loam, 6 to 12 percent slopes, severely eroded
TrD2	Trappist silt loam, 12 to 18 percent slopes, eroded
TrD3	Trappist silt loam, 12 to 18 percent slopes, severely eroded
UnB2	Uniontown silt loam, 2 to 6 percent slopes, eroded
UnC2	Uniontown silt loam, 6 to 12 percent slopes, eroded
Wa	Wakeland silt loam
WcG	Weikert channery silt loam, 35 to 90 percent slopes
WeA	Weinbach silt loam, 0 to 2 percent slopes
WhB2	Wheeling fine sandy loam, 2 to 6 percent slopes, eroded
WhC2	Wheeling fine sandy loam, 6 to 12 percent slopes, eroded
WlA	Wheeling silt loam, 0 to 2 percent slopes
WlB2	Wheeling silt loam, 2 to 6 percent slopes, eroded
WlC2	Wheeling silt loam, 6 to 12 percent slopes, eroded
WlD2	Wheeling silt loam, 12 to 18 percent slopes, eroded
Wm	Wilbur silt loam
ZaB2	Zanesville silt loam, 2 to 6 percent slopes, eroded
ZaB3	Zanesville silt loam, 2 to 6 percent slopes, severely eroded
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded
ZaD2	Zanesville silt loam, 12 to 18 percent slopes, eroded
ZaD3	Zanesville silt loam, 12 to 18 percent slopes, severely eroded
Zp	Zipp silty clay

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements

Canal lock (point upstream)

Canals and ditches

Lakes and ponds
- Perennial — water, w
- Intermittent — int

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

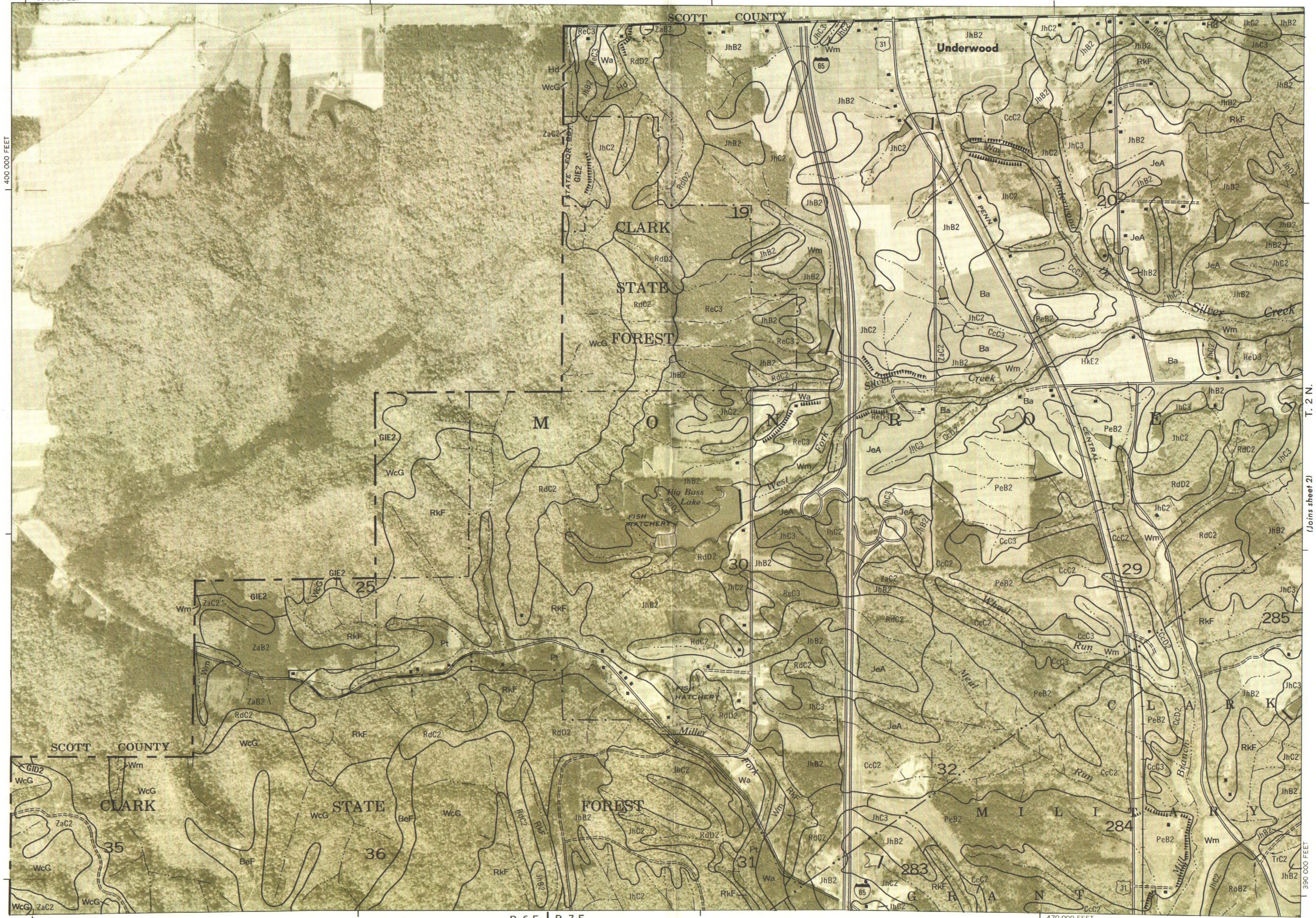
Escarpments
- Bedrock
- Other

Sinkholes, non-crossable one or more per acre — Sinkholes

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stoniness — Stony, Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully



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R. 6 E. | R. 7 E.

CLARK AND FLOYD COUNTIES, INDIANA NO. 1

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

1

Land division corners are approximately positioned on this map.

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CLARK AND FLOYD COUNTIES, INDIANA NO. 3

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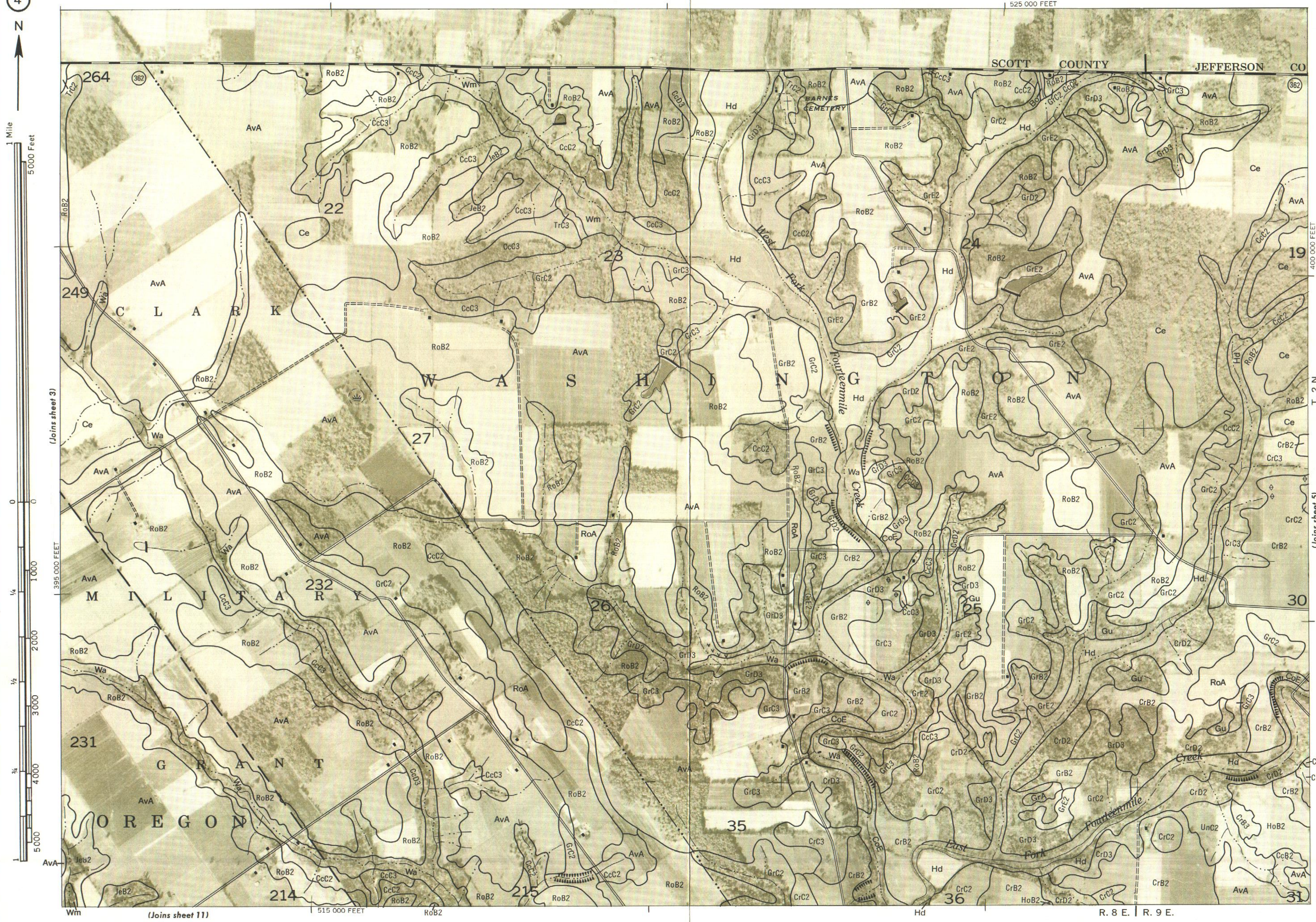
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 4



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Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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CLARK AND FLOYD COUNTIES, INDIANA NO. 4

CLARK AND FLOYD COUNTIES, INDIANA NO. 5

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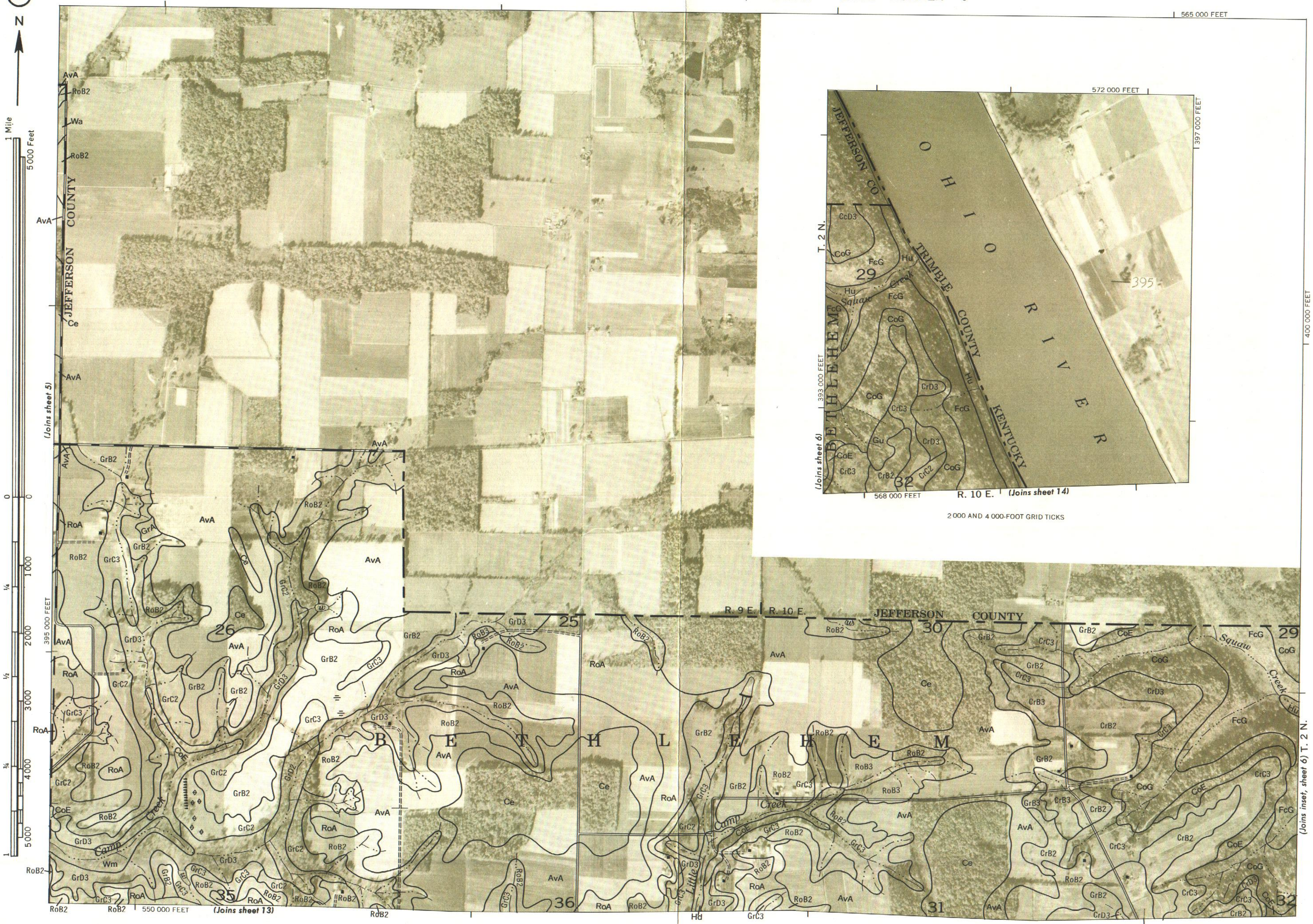
Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 6



Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

CLARK AND FLOYD COUNTIES, INDIANA NO. 7

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Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

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CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 8

Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

CLARK AND FLOYD COUNTIES, INDIANA NO. 8

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CLARK AND FLOYD COUNTIES, INDIANA NO. 9

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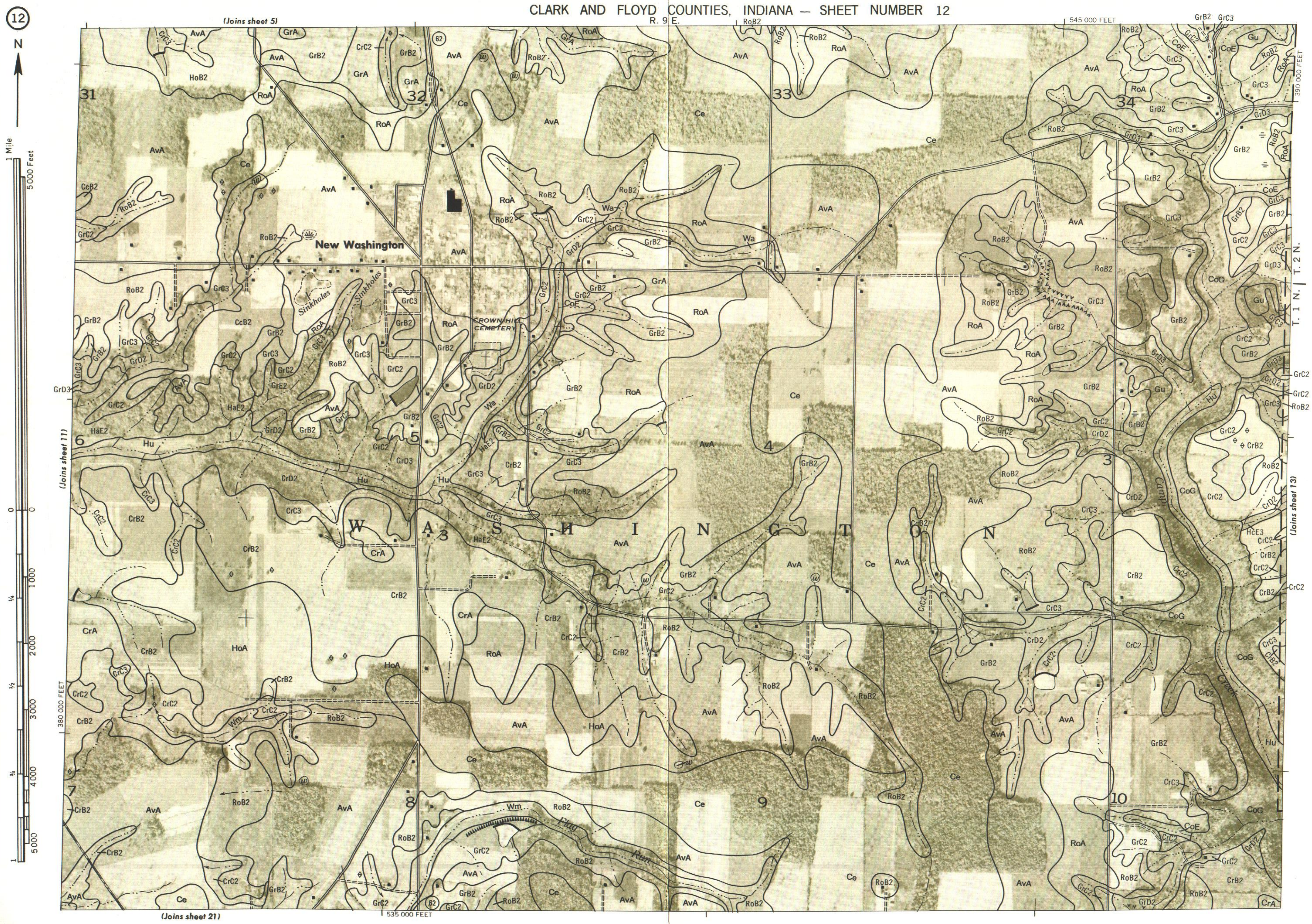
CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 11

CLARK AND FLOYD COUNTIES, INDIANA NO. 11

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.



Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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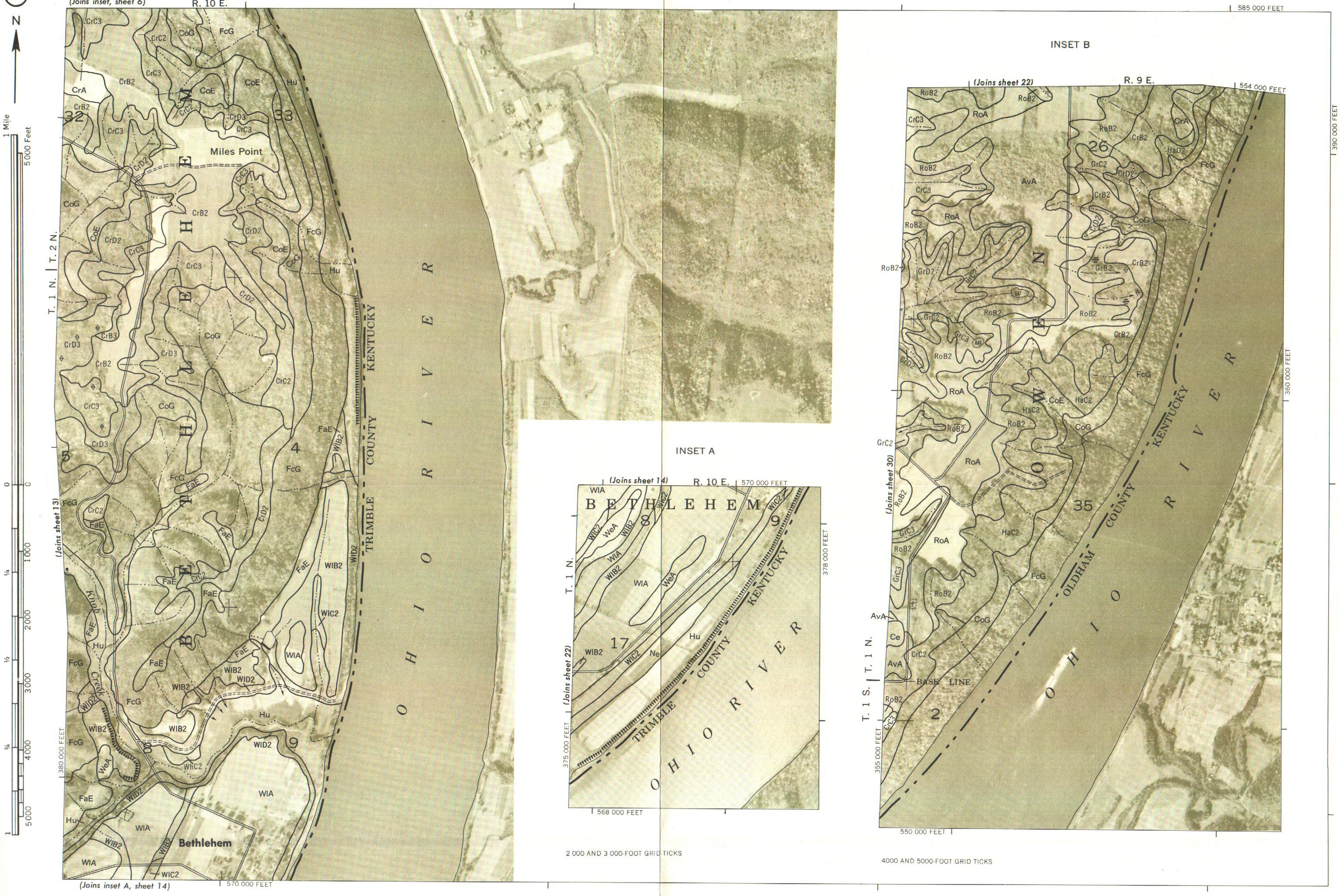
Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA NO. 13

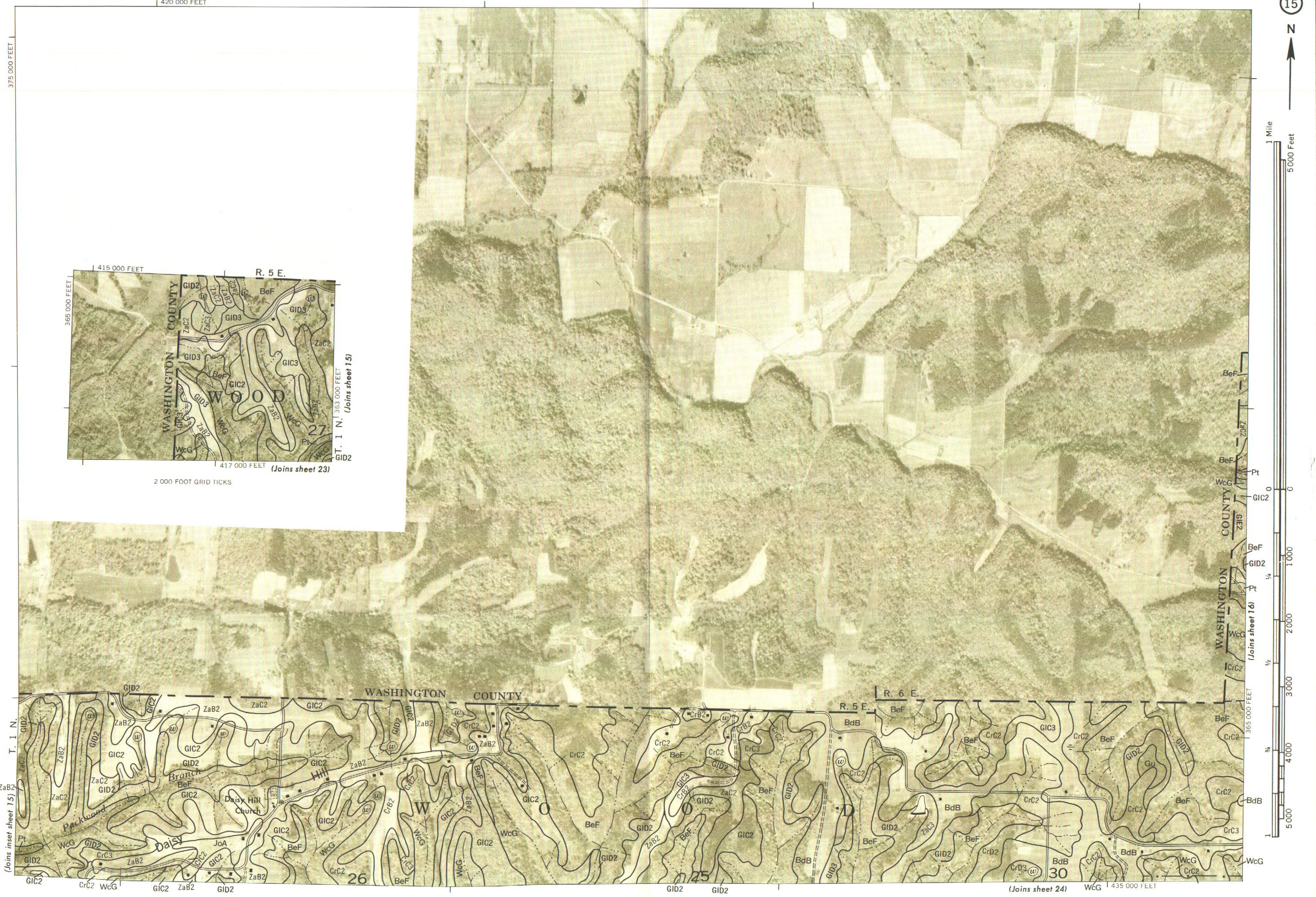
CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 14



Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



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CLARK AND FLOYD COUNTIES, INDIANA NO. 15

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 16

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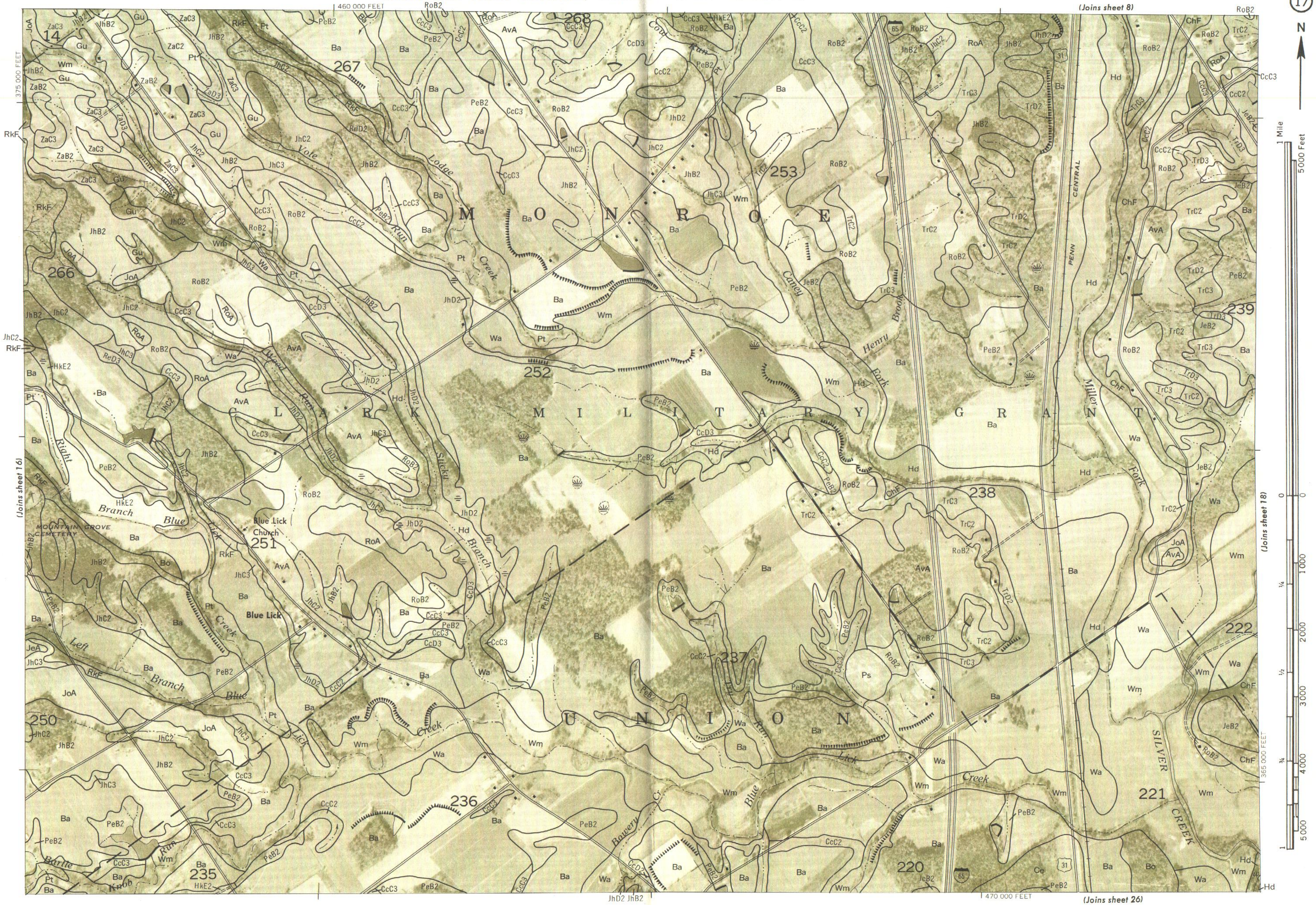
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.



CLARK AND FLOYD COUNTIES, INDIANA NO. 17

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

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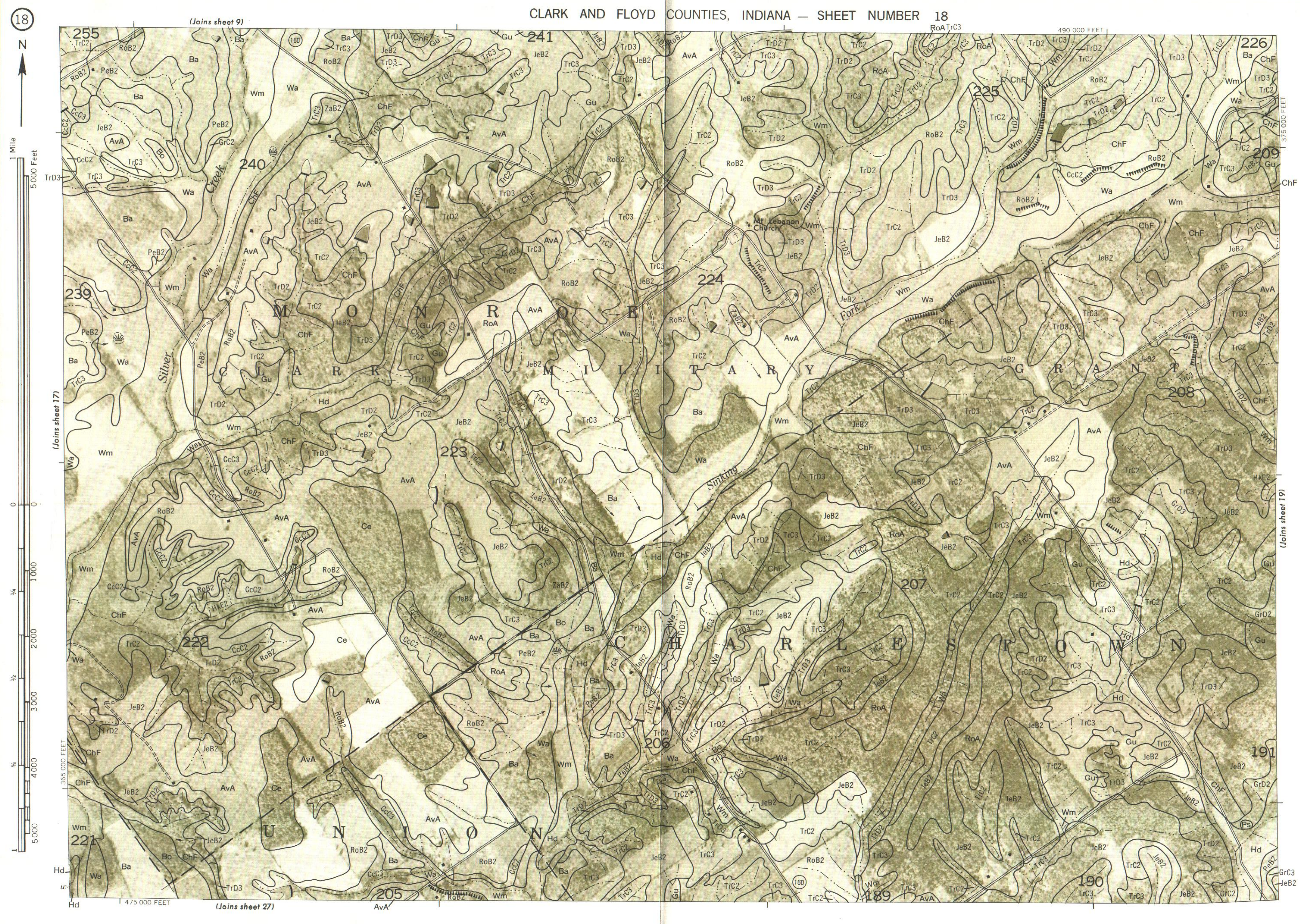
Land division corners are approximately positioned on this map.



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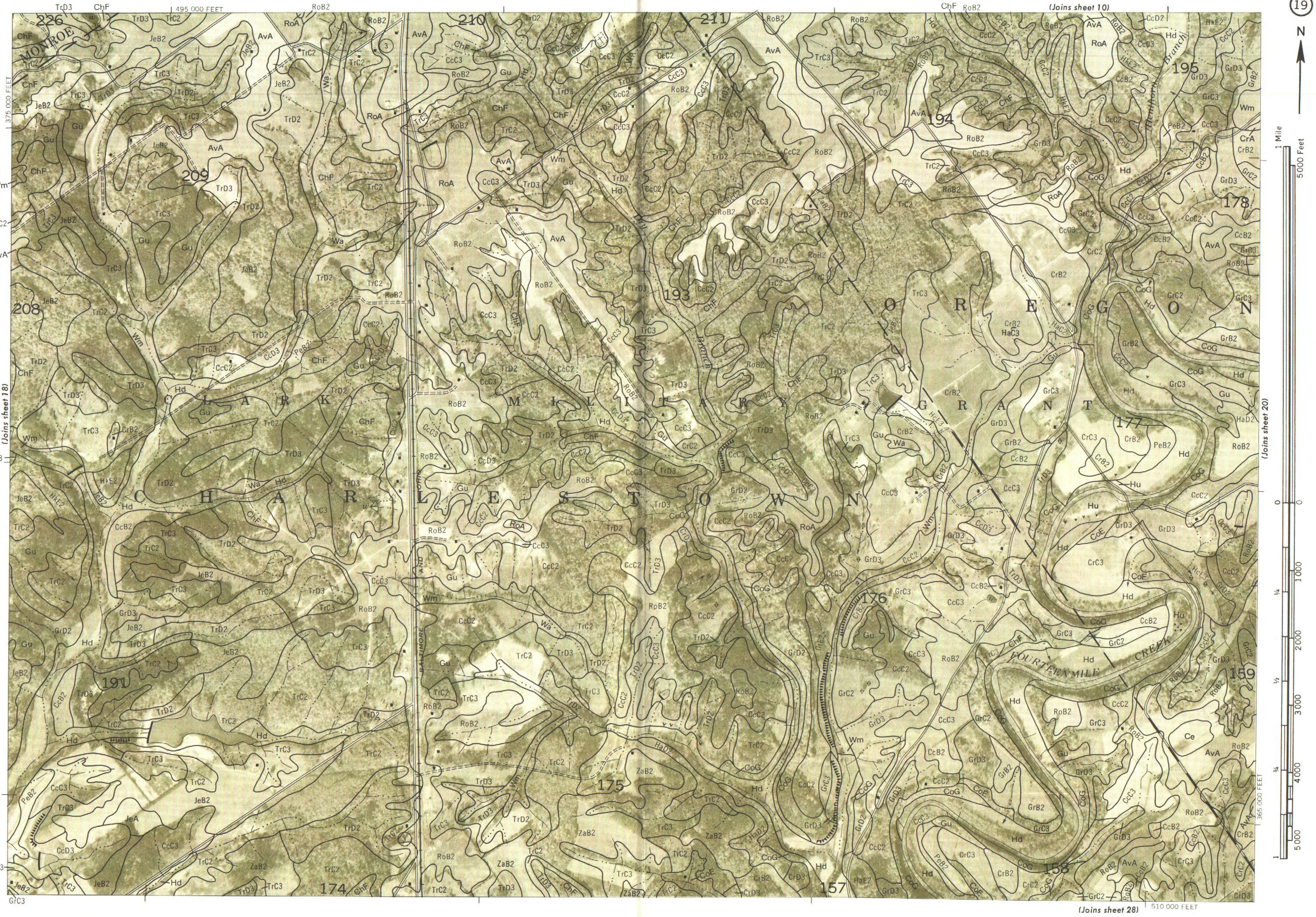
CLARK AND FLOYD COUNTIES, INDIANA NO. 18



This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
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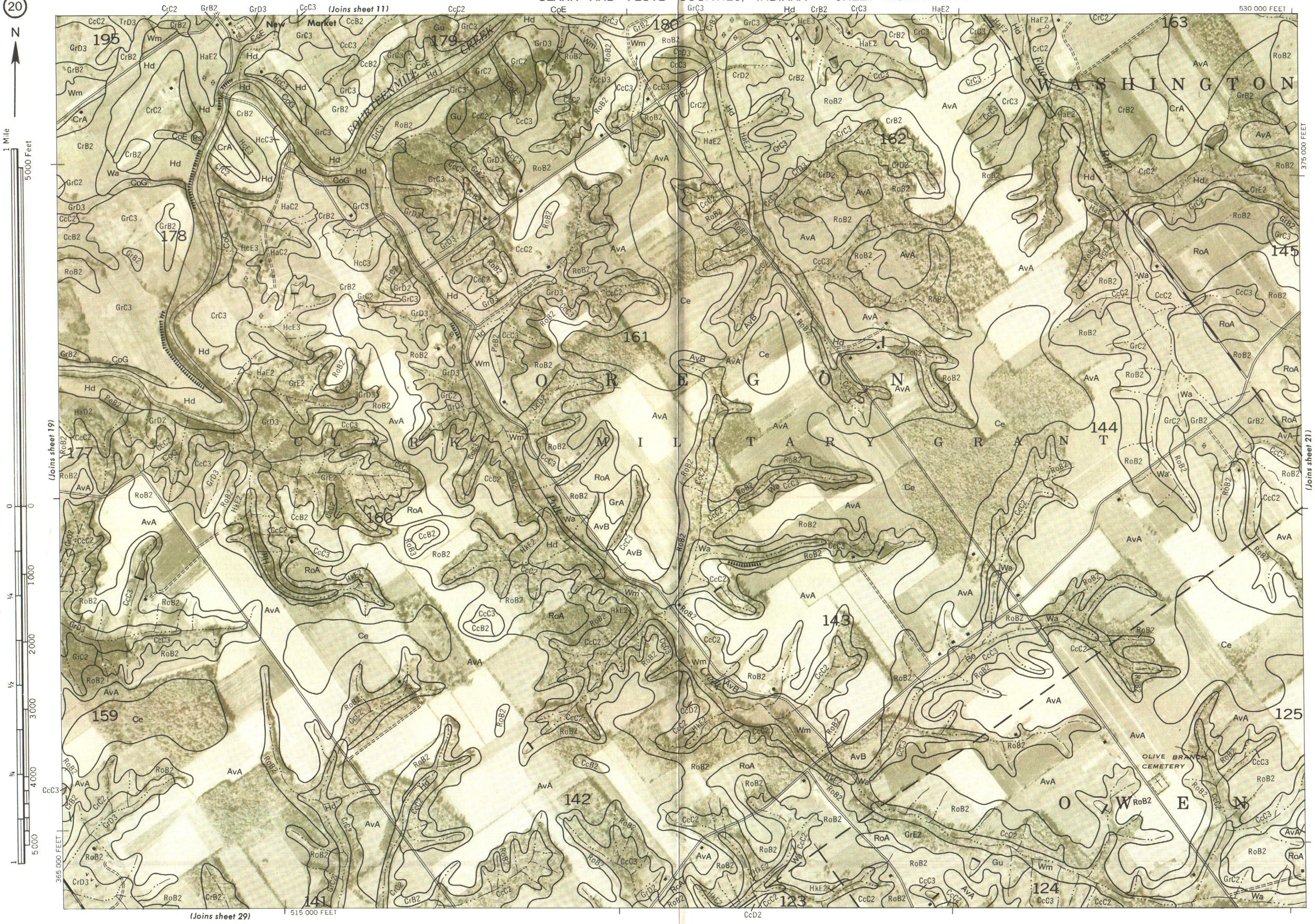
CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 20



Land division corners are approximately positioned on this map.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
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CLARK AND FLOYD COUNTIES, INDIANA NO. 21

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22

Land division corners are approximately positioned on this map.
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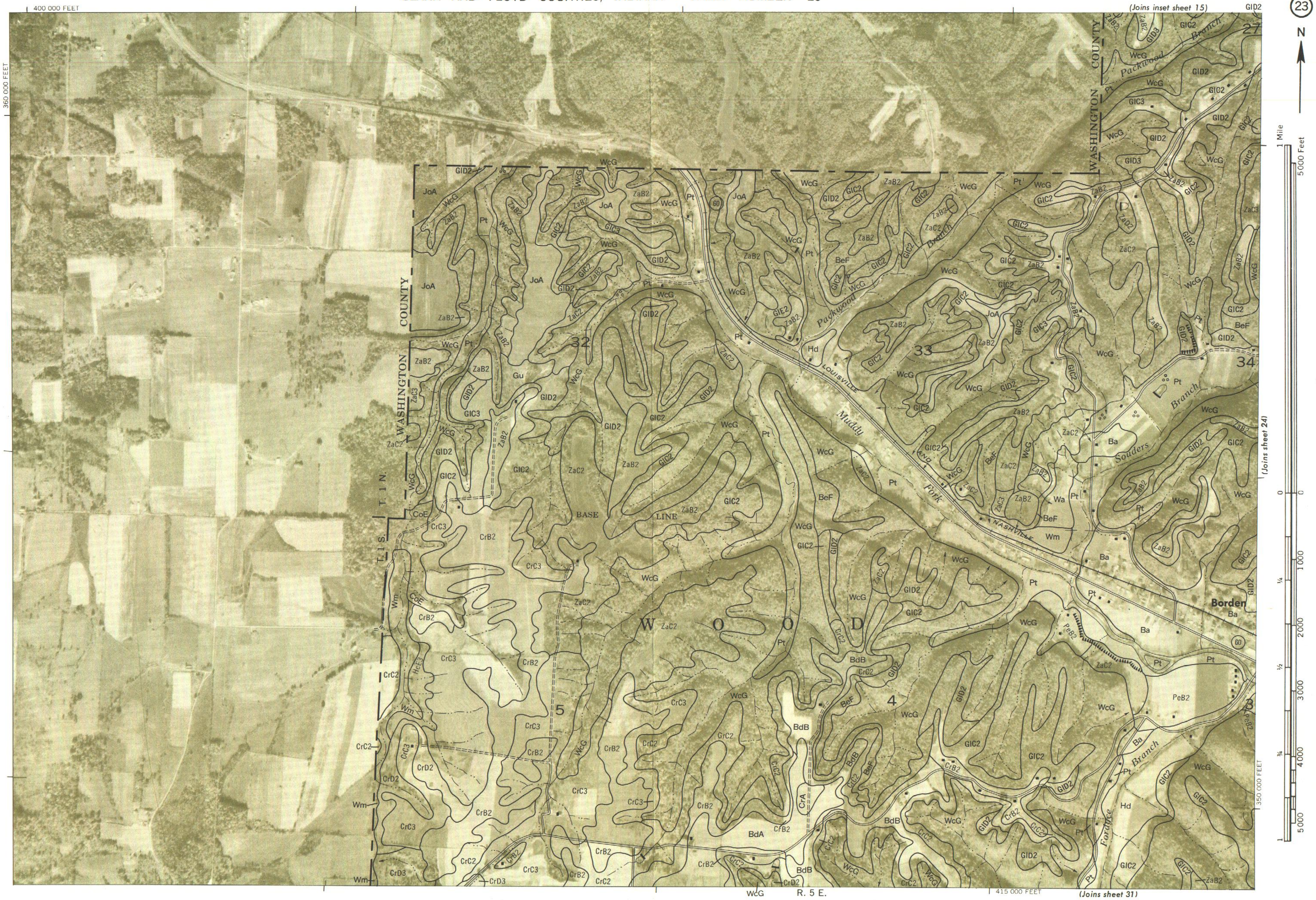

CLARK AND FLOYD COUNTIES, INDIANA NO. 23

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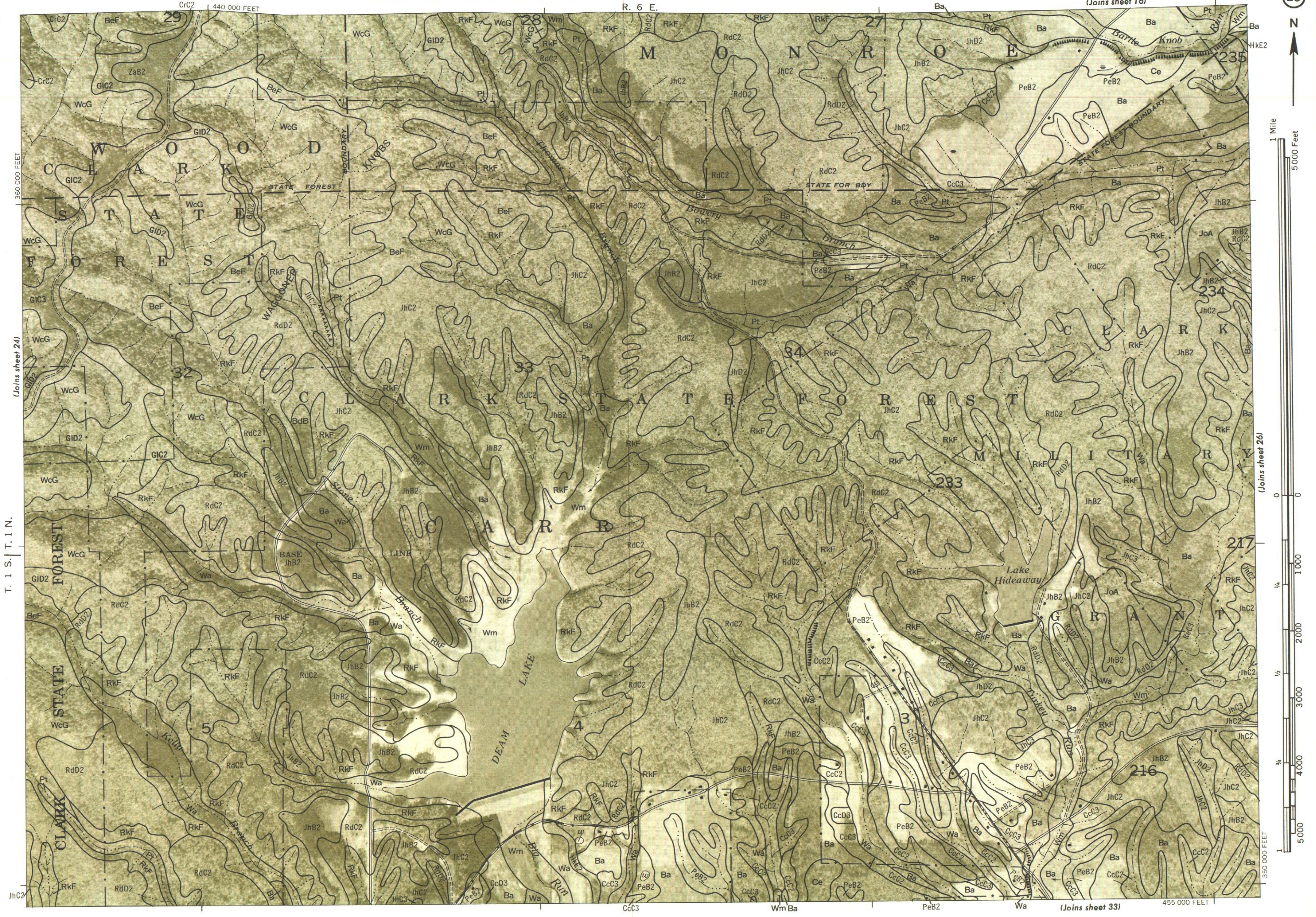

CLARK AND FLOYD COUNTIES, INDIANA NO. 25

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
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CLARK AND FLOYD COUNTIES, INDIANA NO. 27

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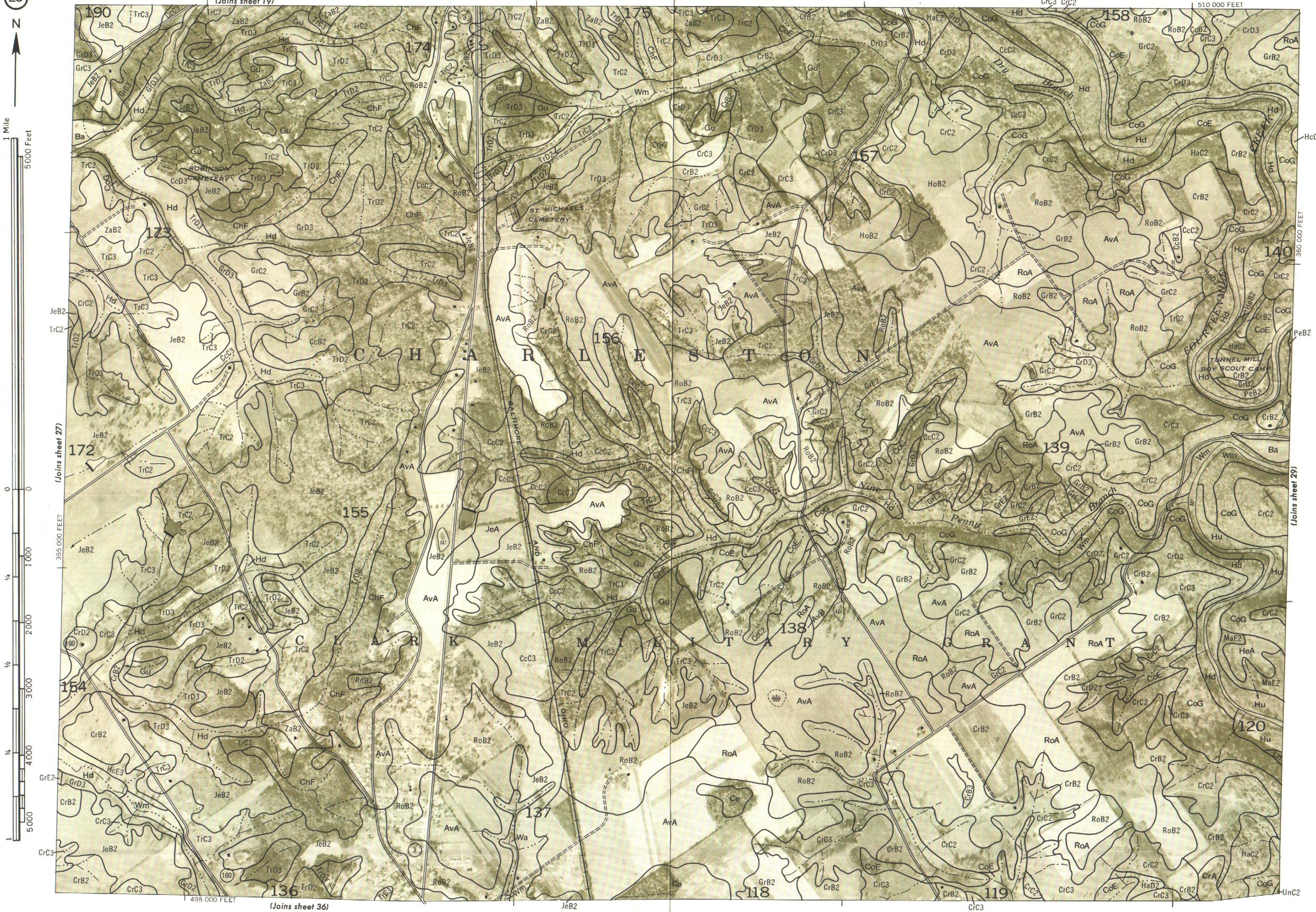
Land division corners are approximately positioned on this map.



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29

CLARK AND FLOYD COUNTIES, INDIANA NO. 29
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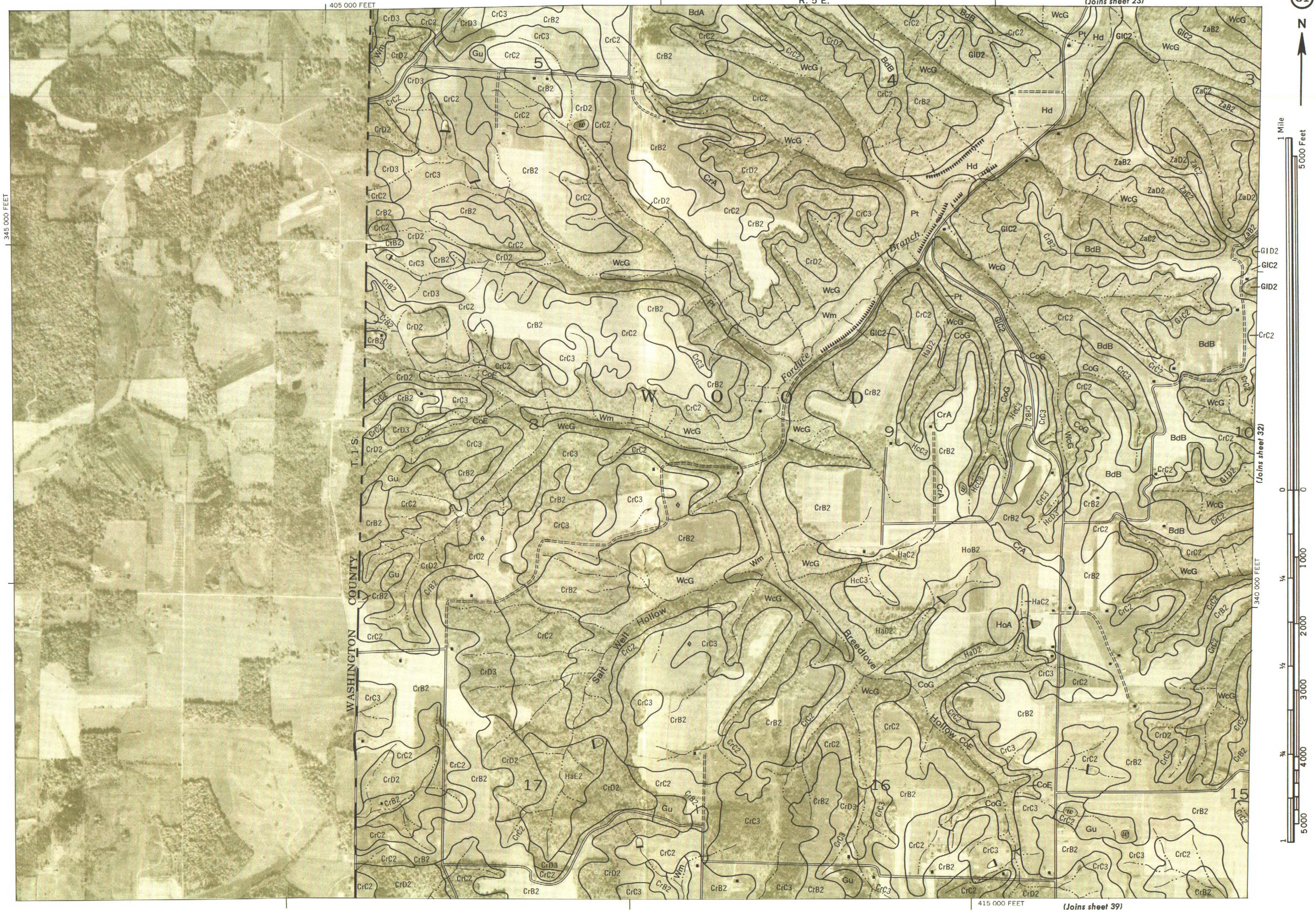

CLARK AND FLOYD COUNTIES, INDIANA NO. 31

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
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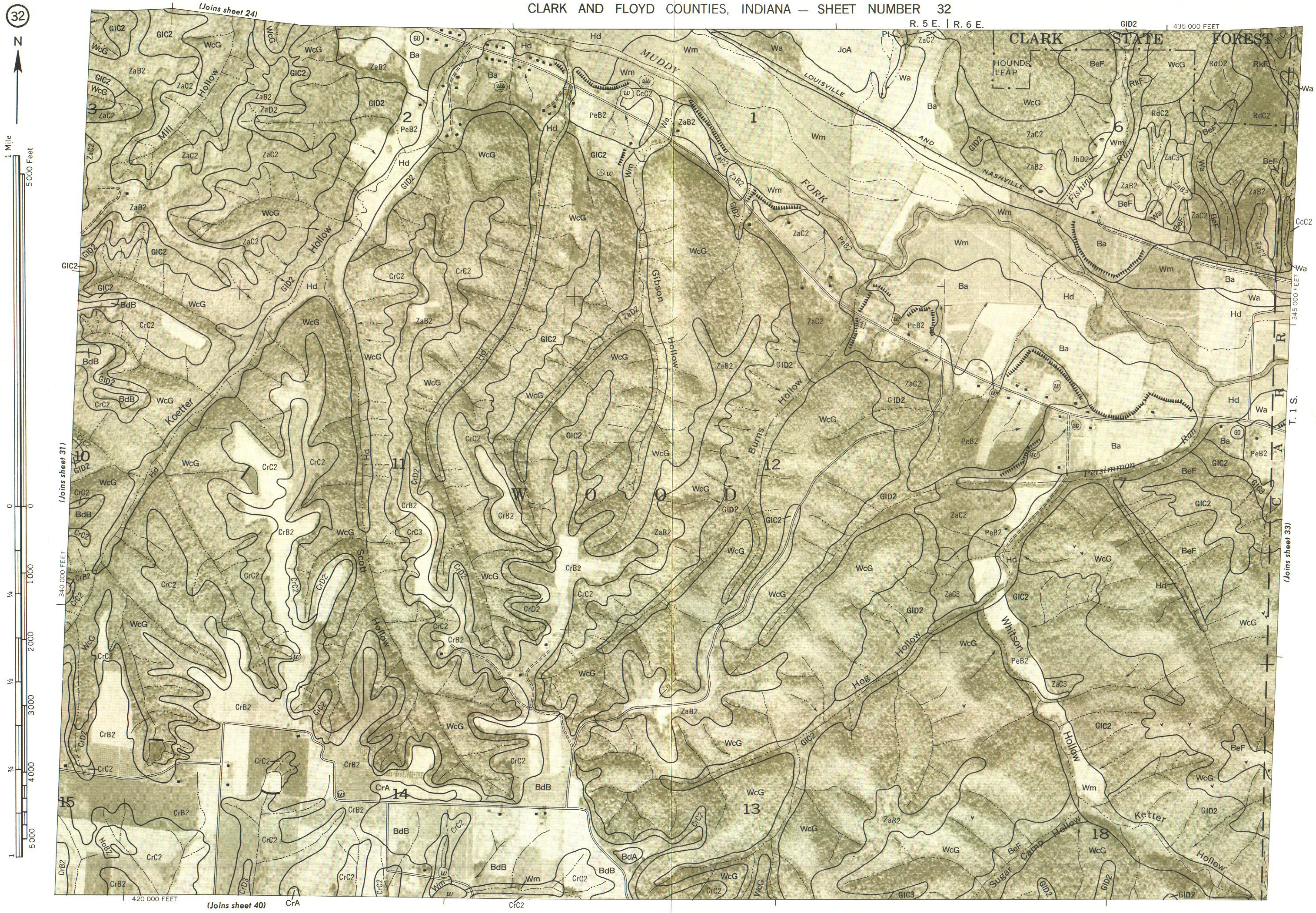
Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 32



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CLARK AND FLOYD COUNTIES, INDIANA NO. 32

CLARK AND FLOYD COUNTIES, INDIANA NO. 33
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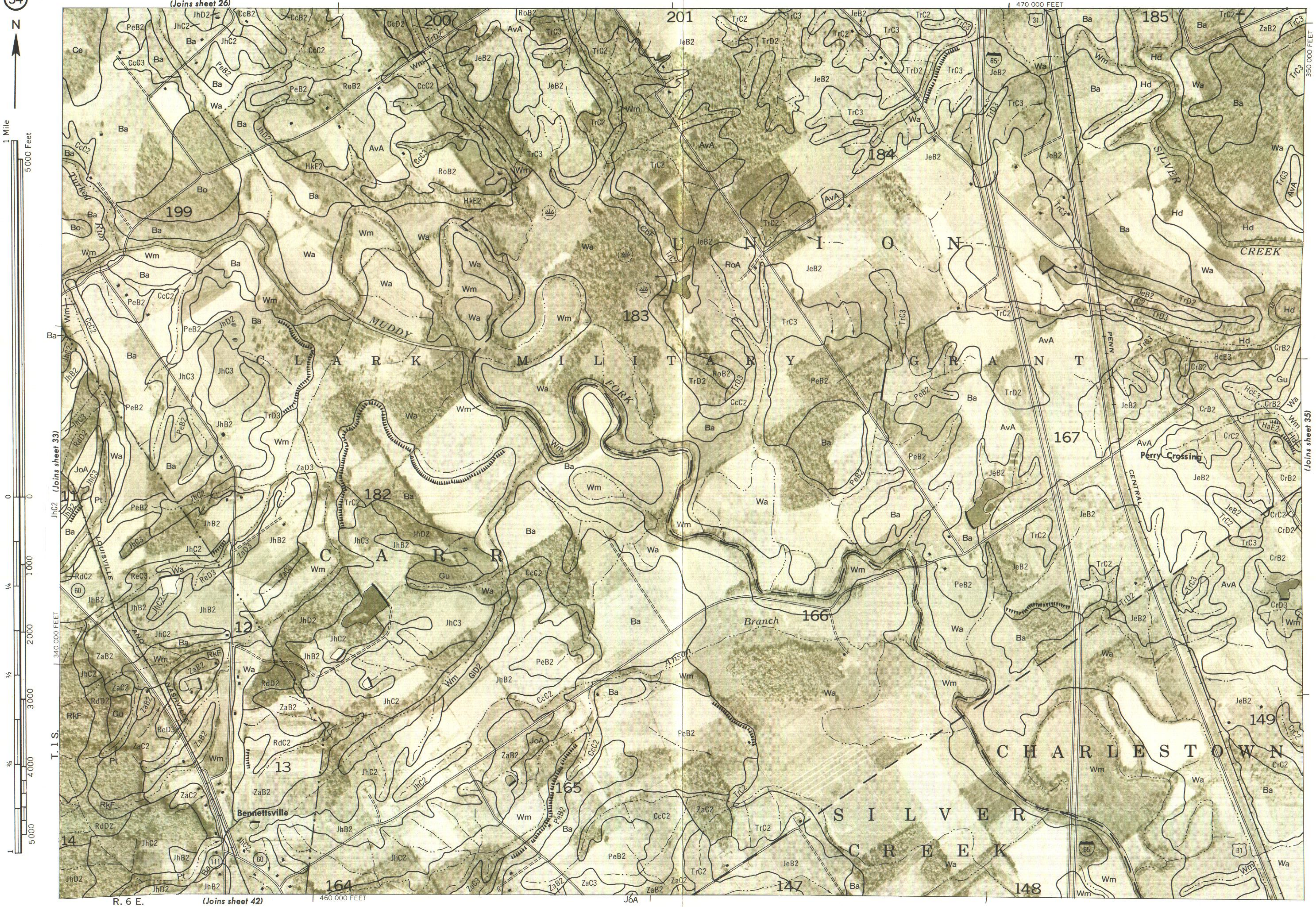
Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 34



Land division corners are approximately positioned on this map.

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CLARK AND FLOYD COUNTIES, INDIANA NO. 35

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 36

Land division corners are approximately positioned on this map.

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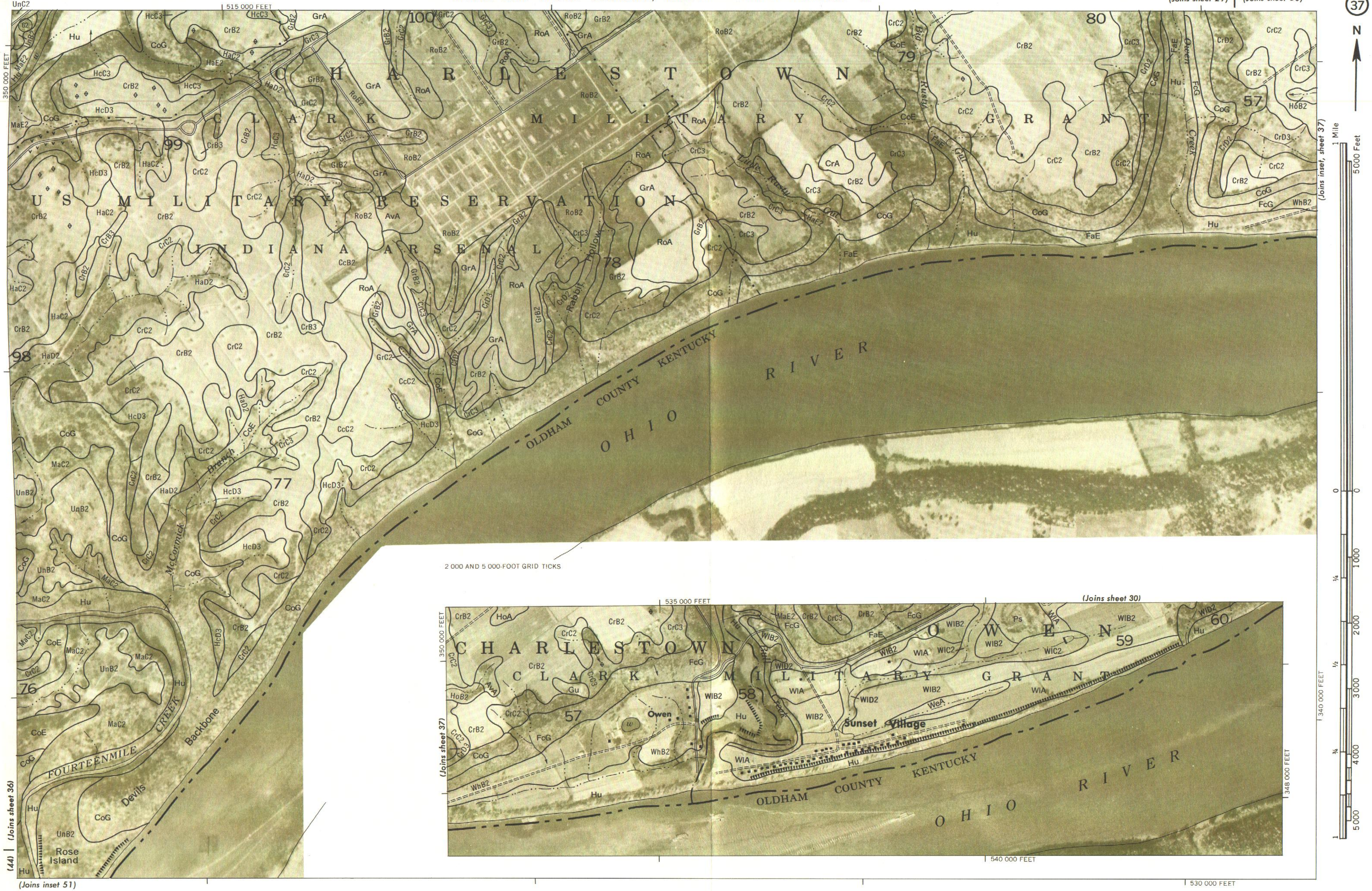

CLARK AND FLOYD COUNTIES, INDIANA NO. 37

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

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CLARK AND FLOYD COUNTIES, INDIANA NO. 39

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CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 40

Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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CLARK AND FLOYD COUNTIES, INDIANA NO. 40

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 41

CLARK AND FLOYD COUNTIES, INDIANA NO. 41

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
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CLARK AND FLOYD COUNTIES, INDIANA NO. 43

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
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CLARK AND FLOYD COUNTIES, INDIANA NO. 45

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CLARK AND FLOYD COUNTIES, INDIANA NO. 47

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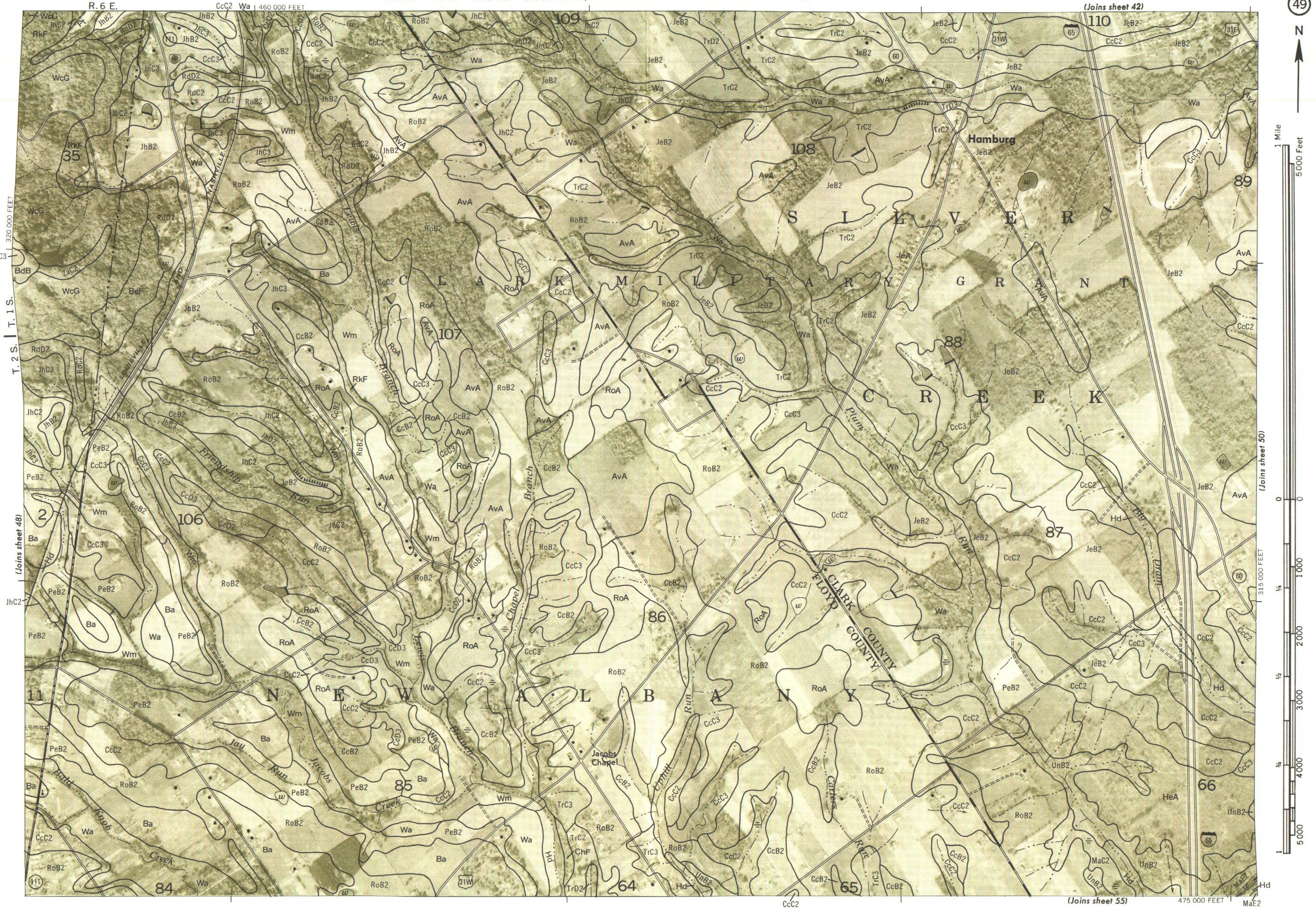
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 48

Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



CLARK AND FLOYD COUNTIES, INDIANA NO. 49

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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CLARK AND FLOYD COUNTIES, INDIANA NO. 50

CLARK AND FLOYD COUNTIES, INDIANA NO. 51

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
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CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 53

CLARK AND FLOYD COUNTIES, INDIANA NO. 53

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 54

Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 56

Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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CLARK AND FLOYD COUNTIES, INDIANA NO. 57

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 58

Land division corners are approximately positioned on this map.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

CLARK AND FLOYD COUNTIES, INDIANA NO. 58

CLARK AND FLOYD COUNTIES, INDIANA NO. 59

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
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CLARK AND FLOYD COUNTIES, INDIANA NO. 61

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CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 63

CLARK AND FLOYD COUNTIES, INDIANA NO. 63

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CLARK AND FLOYD COUNTIES, INDIANA NO. 65

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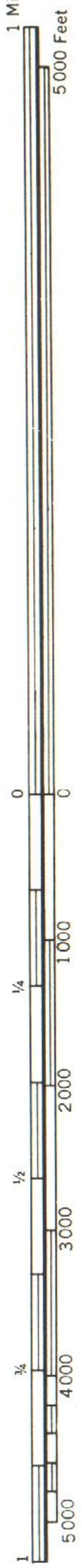
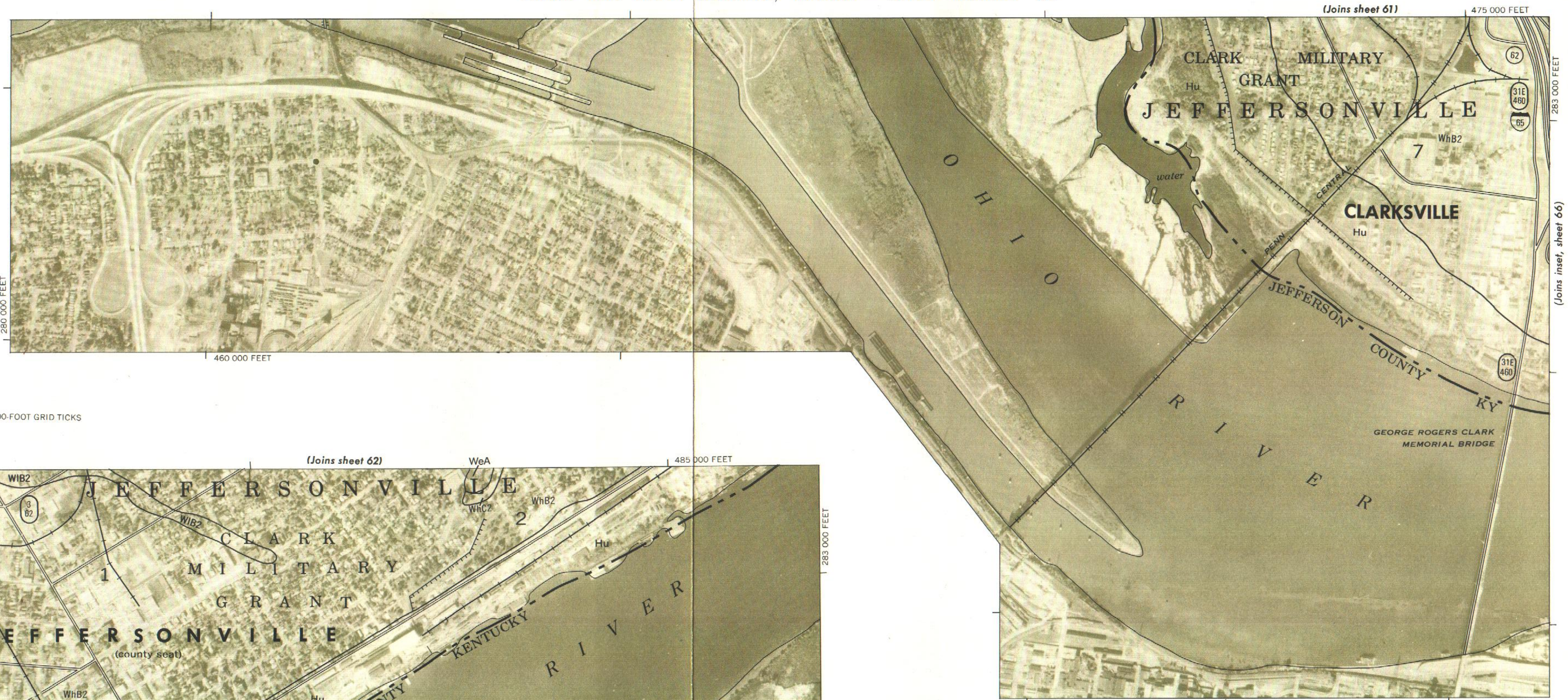
CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 66

N





3 000 AND 5 000-FOOT GRID TICKS

3 000 AND 5 000-FOOT GRID TICKS

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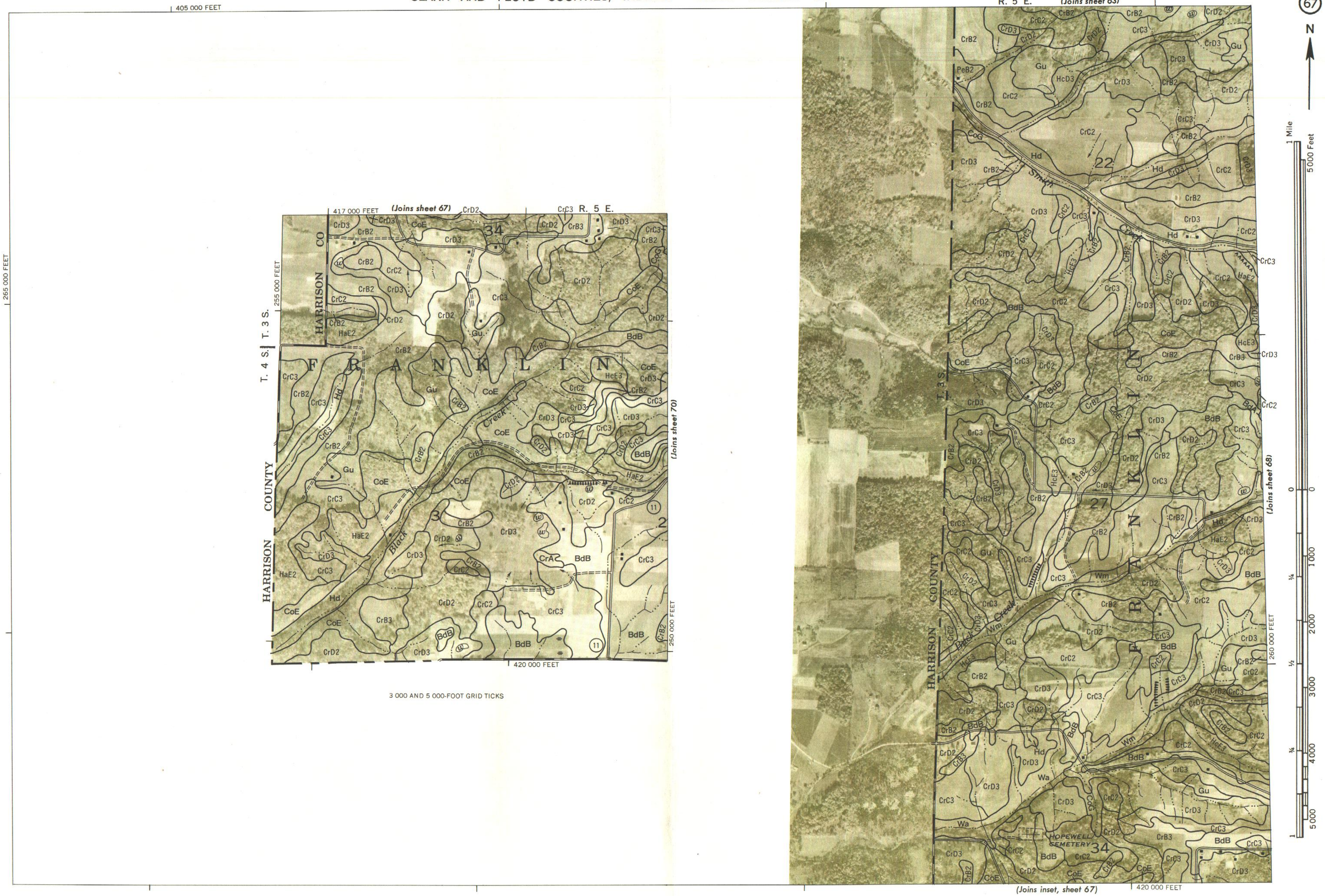
CLARK AND FLOYD COUNTIES, INDIANA NO. 66



CLARK AND FLOYD COUNTIES, INDIANA NO. 67

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
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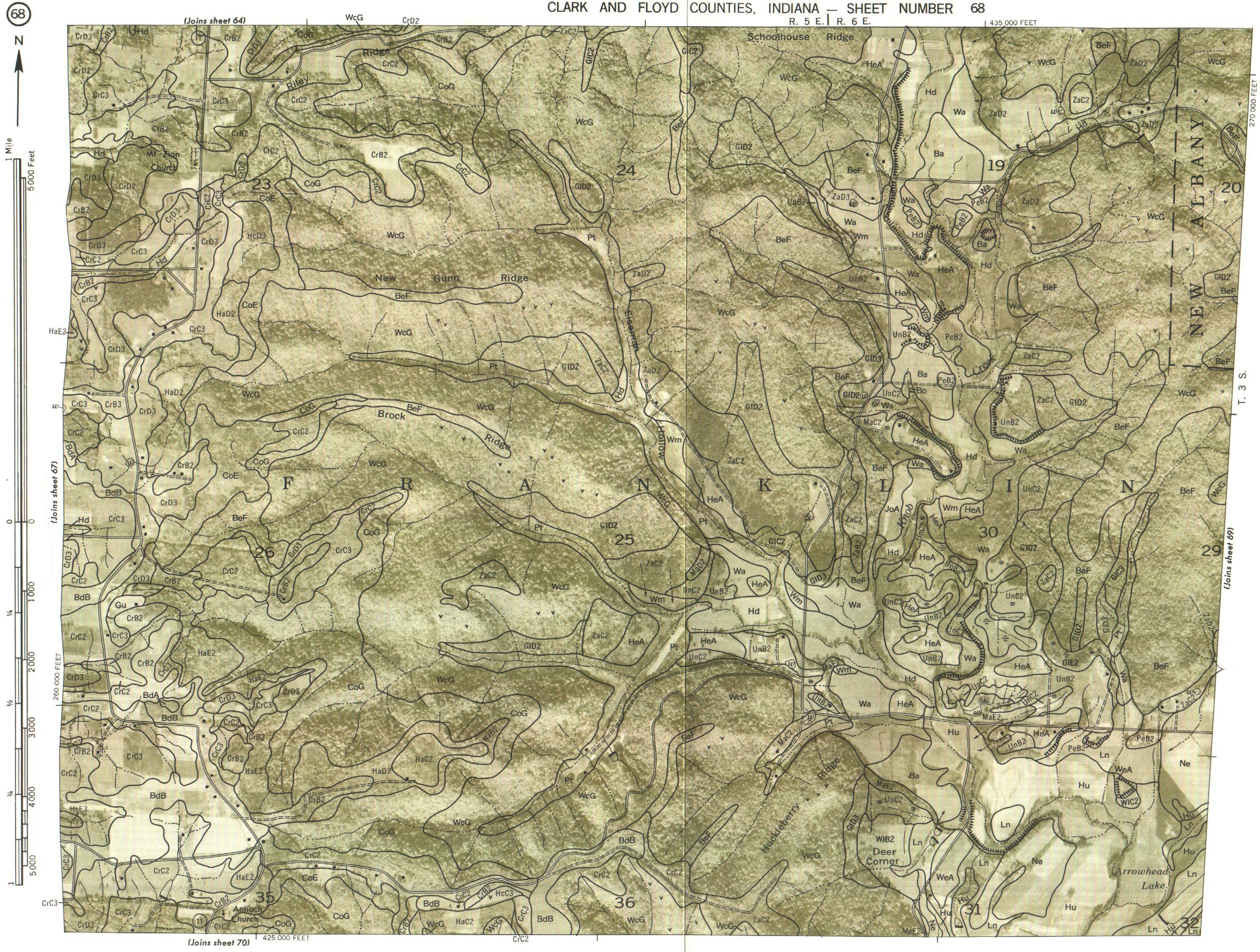

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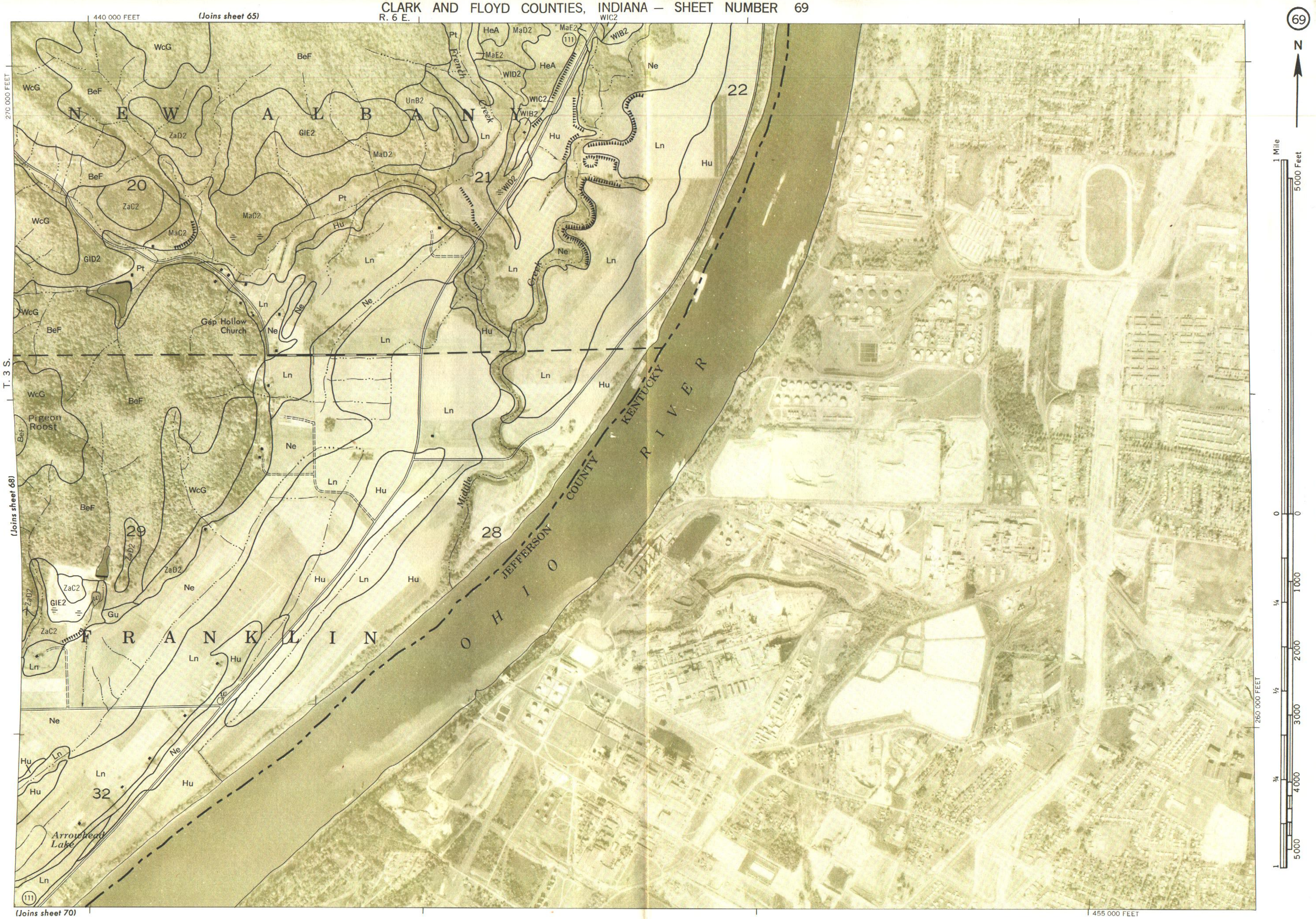
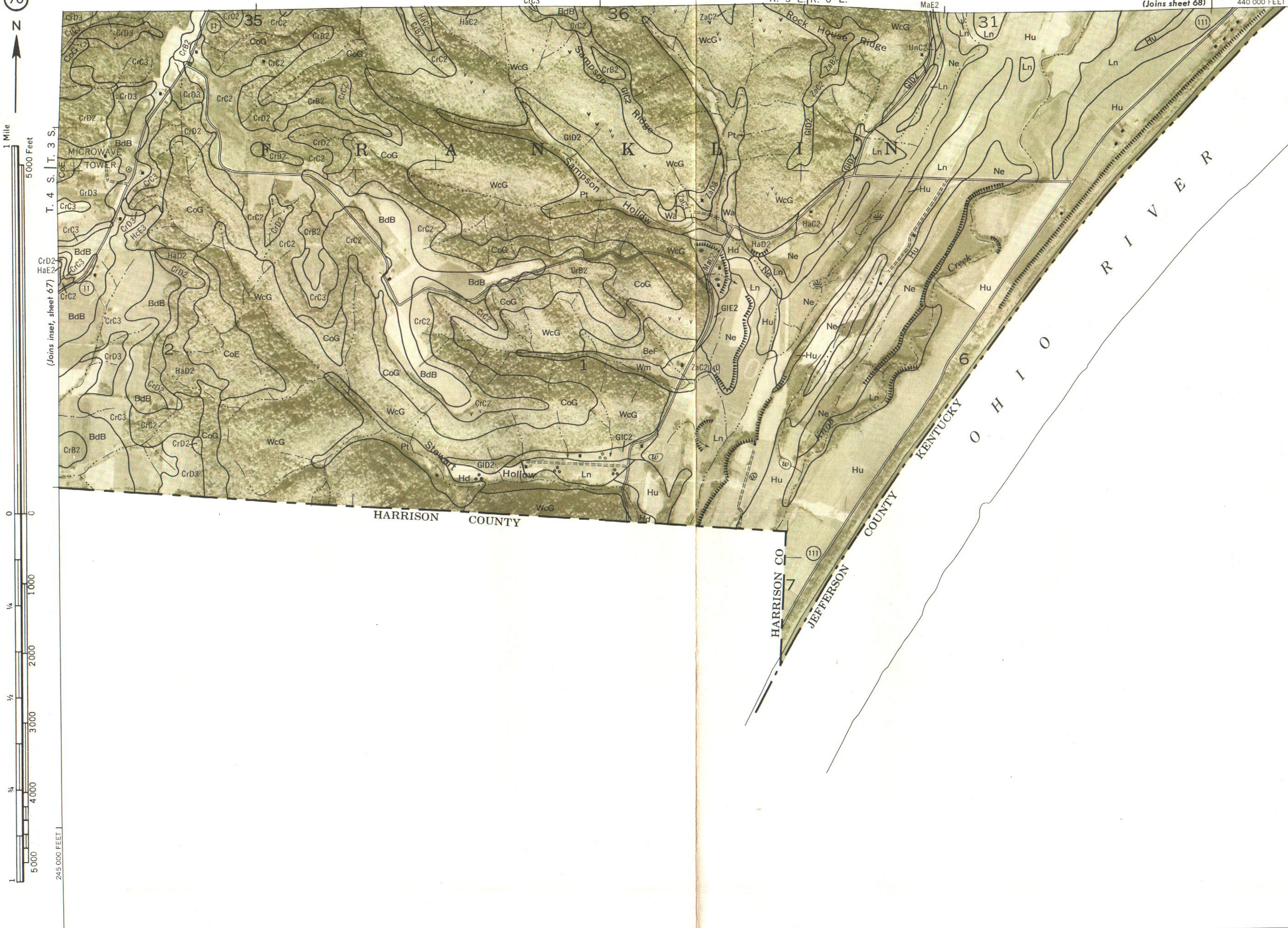
Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



CLARK AND FLOYD COUNTIES, INDIANA NO. 69

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station. Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone. Land division corners are approximately positioned on this map.

CLARK AND FLOYD COUNTIES, INDIANA — SHEET NUMBER 70



Land division corners are approximately positioned on this map.

Photobase from 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.